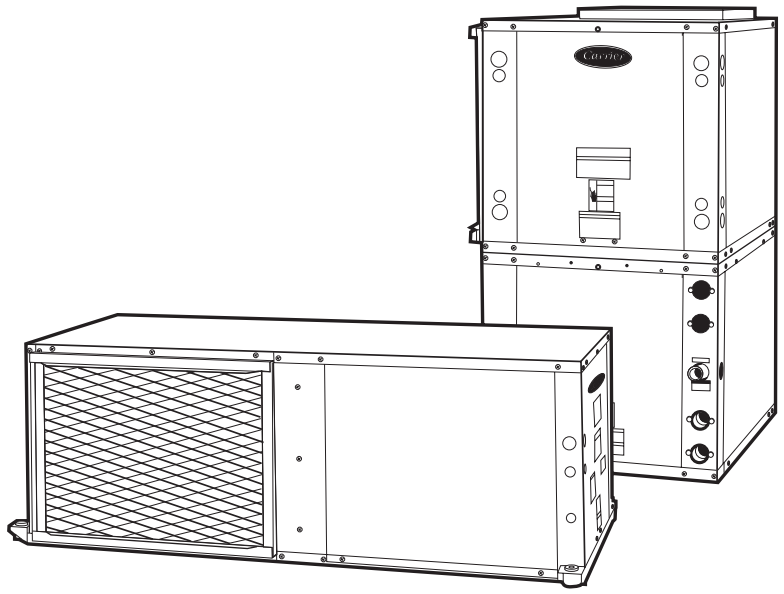
Carrier®

Product Data

AQUAZONE™ 50RHR006-060,50RVR009-060 High-Efficiency Water Source Heat Pumps

Horizontal — 1/2 to 5 Nominal Tons
Vertical — 3/4 to 5 Nominal Tons

AQUAZONE™



ASHRAE 90.1 COMPLIANT

Single-package horizontally and vertically mounted water source heat pumps (WSHPs) with electronic controls offer:

- High-efficiency design
- Operating temperature range of 20 F to 110 F
- Thermostatic expansion valve (TXV) provides efficient and reliable refrigerant flow
- Available mute package for quiet operation
- Three service panels on compressor section for easy maintenance
- Spring-mounted compressors for quiet operation
- Ease of installation with factory-mounted flow regulators and control valves

Features/Benefits

Aquazone high-efficiency WSHPs are a flexible alternative for all boiler/tower and geothermal design applications.

Operating efficiency

The horizontal and vertical WSHPs are designed for quality and high performance over a lifetime of operation. Aquazone high efficiency units offer cooling EERs (Energy Efficiency Ratios) to 13.3 and heating COPs (Coefficients of Performance) to 4.6. Efficiencies stated are in accordance with standard conditions under ISO (International Organization for Standardization) Standard 13256-1 and provide among the highest ratings in the industry, exceeding ASHRAE (American Society of Heating, Refrigerant and Air Conditioning Engineers) 90.1 Energy Standards.

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Features/Benefits (cont)

High quality construction and testing

All units are manufactured to meet extensive quality control protocol from start to finish through an automated control system, which provides continuous monitoring of each unit and performs quality control checks as equipment progresses through the production process. Standard construction features of the Aquazone™ units include:

Cabinet — Standard unit fabrication consists of heavy gage galvanized sheet metal cabinet construction designed for part standardization (i.e., minimal number of parts) and modular design. Cabinet interior surfaces are lined with $^1/_2$ in. thick, $1^1/_2$ lb. acoustic type insulation. Sheet metal surfaces are treated for maximum corrosion protection to ensure resilience for long term vitality. Compact cabinet dimensions are designed to fit tight space limitations in both horizontal and vertical configurations.

Compressor — Aquazone high efficiency units include a rotary compressor design in size 006 through 015, reciprocating compressor in sizes 019 through 048, and scroll compressor in size 060. Compressor isolating springs are specially selected for each compressor size. The external springs are mounted on an isolated railing system (i.e., from the cabinet) that maximizes vibration isolation and minimizes transmission to the unit structure.

Blower and motor assembly — Permanent split capacitor (PSC) three-speed blowers are provided with all units to satisfy many air distribution applications. Blowers can be upgraded on unit size 048 for high-static conditions and fan speed control to accommodate reduced sound operation. Blowers also provide dehumidification control with the correct controller option. Blower motors are designed to operate at lower temperatures to help improve the reliability of the water source heat pump.

Refrigeration/water circuit — Units have a sealed refrigerant circuit including a rotary, reciprocating, or scroll compressor. Refrigerant circuits are provided with a standard thermostatic expansion valve (TXV) for higher accuracy and performance. Also standard are a reversing valve (4-way valve), water-to-refrigerant coaxial (tube-in-tube) coil, and enhanced aluminum fin/rifled copper tube air-to-refrigerant heat exchanger coil.

ARI/ISO — Aquazone units have ARI (Air Conditioning & Refrigeration Institute)/ISO, NRTL (Nationally Recognized Testing Lab), or CSA (Canadian Standards Association) labels and are factory tested under normal operating conditions at nominal water flow rates. Quality assurance is provided via testing report cards shipped with each unit to indicate specific unit performance under cooling and heating modes of operation. Water source heat pumps are New York City MEA (Materials Equipment and Acceptance) 60-00-E rated.

Quiet operation

Fan motor insulation and compressor springs are provided for sound isolation, cabinets are fully insulated to reduce noise transmission, low speed blowers are utilized for quiet operation through reduced outlet air velocities, and air-to-refrigerant coils are designed for lower airflow coil face velocities.

Design flexibility

Airflow configurations for horizontal units are available in four patterns including left or right return, and left, right, or back discharge. Horizontal units are field convertible from left or right discharge to back discharge. Vertical units are available in three airflow patterns including top discharge with right or left return. Extended water temperature range between 20 F and 110 F offers maximum design flexibility for all applications. Water flow rates as low as 1.5 gpm per ton assist with selection from a various range of circulating pumps. Factory-installed options are offered to meet specific design requirements.

Safe, reliable operation

Standard safety features for the refrigerant circuit include high-pressure switch, low-pressure sensor to detect loss of refrigerant and low air temperature sensor to safeguard against freezing. Equipment safety features include water loop temperature monitoring, voltage protection, water coil freeze protection, and standard electronic condensate overflow shutdown. All safety features are tested and run at the factory to assure proper operation of all components and safety switches.

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All components are carefully designed and selected for endurance, durability, and carefree day-to-day operation.

The Aquazone™ unit is shipped to provide internal and external equipment protection. Shipping supports are placed under the blower housing and compressor feet. In addition, horizontal and vertical units are both mounted on oversized pallets with lag bolts for sturdiness and maximum protection during transit.

Ease of installation

The Aquazone unit is packaged for simple low cost handling, with minimal time required for installation. All units are pre-wired and factory charged with refrigerant. Horizontal units are provided with factory-installed hanger isolation brackets. Vertical units are provided with an internally trapped condensate drain to reduce labor associated with installing an external trap for each unit. Water connections (FPT) and condensate drains (FPT) are anchored securely to the unit cabinet.

Simple maintenance and serviceability

The Aquazone WSHP units are constructed to provide ease of maintenance. All units allow access to compressor section from 3 sides with large removable panels for easy access. Additional panels are provided to access the blower and control box sections.

The blower housing assembly can be serviced without disconnecting ductwork from the dedicated blower access panel. Blower units are provided with permanently lubricated bearings for worry-free performance. Blower inlet rings allow removal of the blower wheel without having to remove the housing or ductwork connections.

Electrical disconnection of the blower motor and control box is easily accomplished from quick disconnects on each component.

Easy removal of the control box from the unit provides access to all refrigeration components.

The refrigeration circuit is easily tested and serviced through the use of high and low pressure ports integral to the refrigeration circuit.

Maximum control flexibility

Aquazone water source heat pumps provide reliable control operation using a standard microprocessor board with flexible alternatives for many direct digital control (DDC) applications including the Carrier Comfort Network® (CCN) and open protocol systems.

Carrier's Aquazone standard unit solid-state control system, the Complete C, provides control of the unit compressor, reversing valve, fan, safety features, and troubleshooting fault indication features. The Complete C control system is one of the most user friendly, low cost, and advanced control boards found in the WSHP industry. Many features are field selectable to provide the ultimate in field installation flexibility. The overall features of this standard control system include:

50-va transformer — The transformer assists in accommodating accessory loads.

Anti-short cycle timer — Timer provides a minimum off time to prevent the unit from short cycling. The 5-minute timer energizes when the compressor is deenergized, resulting in a 5-minute delay before the unit can be restarted.

Random start relay — Random start relay ensures a random delay in energizing each different WSHP unit. This option minimizes peak electrical demand during start-up from different operating modes or after building power outages.

High and low pressure refrigerant protection — This protection safeguards against unreliable unit operation and prevents refrigerant from leaking.

Condensate overflow sensor — The electronic sensor is mounted to the drain pan. When condensate pan liquid reaches an unacceptable level, unit is automatically deactivated and placed in a lockout condition. Thirty continuous seconds of overflow is recognized as a fault by the sensor.

High and low voltage protection — This safety protection for excessive or low voltage conditions.

Automatic intelligent reset — Unit shall automatically restart 5 minutes after shutdown if the fault has cleared. Should a fault occur 3 times sequentially, lockout will occur.

Accessory output — Twenty-four volt output is provided to cycle a motorized water valve or damper actuator with compressor in applications such as variable speed pumping arrangements.

Performance monitor (PM) — This unique feature monitors water temperatures to warn when the heat pump is operating inefficiently or beyond typical operating range. Field selectable switch initiates a warning code on the unit display.

Water coil freeze protection (selectable for water or anti-freeze) — A field selectable switch for water and water/glycol solution systems initiates a fault when temperatures exceed the selected limit for 30 continuous seconds.

Air coil freeze protection (check filter operation) — A field selectable switch for assessing excessive filter pressure drop initiates a fault when temperatures exceed the selected limit for 30 continuous seconds.

Alarm relay setting — A selectable 24-v or pilot duty dry contact provides activation of a remote alarm.

Electric heat option — An output is provided on the controller for operating two stages of emergency electric heat.

Service Test mode with diagnostic LED (light-emitting diode) — The Test mode allows service personnel to check the operation of the WSHP and control system efficiently. Upon entering Test mode, time delays are sped up, and the Status LED will flash a code to indicate the last fault experienced for easy diagnosis. Based on the fault code flashed by the status LED, system diagnostics are assisted through the use of Carrier provided troubleshooting tables for easy reference to typical problems.

LED visual output — An LED panel indicates high pressure, low pressure, low voltage, high voltage, air/water freeze protection, condensate overflow, and control status.

Features/Benefits (cont)

PremierLink™ controller adds reliability, efficiency, and simplification

The PremierLink direct digital controller can be ordered as a factory-installed option. Designed and manufactured exclusively by Carrier, the controller can be used to actively monitor and control all modes of operation as well as monitor the following diagnostics and features: unit number, zone temperature, zone set point, zone humidity set point, discharge air temperatures, fan status, stages of heating, stages of cooling, outdoor-air temperature, leaving-air temperature, leaving water temperature, alarm status, and alarm lockout condition.

This controller has a 38.4K baud communications capability and is compatible with *Comfort*Link™ controls, CCN and ComfortVIEW™ software. The scrolling marquee and Navigator™ display are optional tools that can be used for programming and monitoring the unit for optimal performance. The addition of the Carrier CO_2 sensor in the conditioned space provides ASHRAE 62-99 compliance and demand controlled ventilation (DCV). A DCV control strategy is especially beneficial for a water source heat pump system to minimize the energy utilized to condition ventilation air. In combination with energy efficient Aquazone units, DCV may be the most energy efficient approach ever developed for a water source heat pump system.

The PremierLink peer-to-peer, Internet ready communicating control is designed specifically for constant volume (CV) and variable volume/variable temperature (VVT®) applications. This comprehensive controls system allows water source heat pumps to be linked together to create a fully functional HVAC (heating, ventilation, and air conditioning) automation system.

Model number nomenclature

50RHR,RVR HIGH EFFICIENCY

50RH R 006 S C C 3 0 1 3 0

Aquazone™ Water Source Heat Pump
50RH – Horizontal Configuration
50RV – Vertical Configuration

Efficiency Type
R – High Efficiency

Size – Nominal Tons

***006**	– 1/2	**030**	– 2-1/2
009	– 3/4	**036**	– 3
012	– 1	**042**	– 3-1/2
015	– 1-1/4	**†048**	– 4
019	– 1-1/2	**060**	– 5
024	– 2		

Airflow Configuration

50RHR Units

Code	Return	Discharge
S	Left	Right
E	Left	Back
Z	Right	Left
B	Right	Back

50RVR Units

Code	Return	Discharge
L	Left	Top
R	Right	Top

50RHR048-High Static Units

Code	Return	Discharge
D	Left	Right
F	Left	Back
A	Right	Left
C	Right	Back

50RVR048-High Static Units

Code	Return	Discharge
M	Left	Top
G	Right	Top

Controls
C – Complete C Microprocessor Control
D – Deluxe D Microprocessor Control
P – PremierLink DDC Control††

Water Circuit Options
0 – None
8 – Autoflow Regulator (2.5 gpm per ton)
9 – Autoflow Regulator (3.0 gpm per ton)

Operating Range
1 – Extended Range (20 to 110 F)
2 – Extended Range (20 to 110 F) with Mute Package
3 – Standard Range (60 to 95 F)
4 – Standard Range (60 to 95 F) with Mute Package

Packing
1 – Single Pack

Revision Code
0 – Current Revision

V-Ph-Hz
1 – 575-3-60
3 – 208/230-1-60
4 – 265-1-60**
5 – 208/230-3-60
6 – 460-3-60

Heat Exchanger
C – Copper
N – Cupronickel
T – Copper with two-way water control valve

*Size 006 only available in 50RHR unit.
†Size 048 also available as high static.
**Sizes 042-060 not available as 265-1-60.
††Available with Complete C Microprocessor control only.

ARI/ISO capacity ratings

50RHR,50RVR UNIT WATER LOOP APPLICATIONS

UNIT 50RHR,RVR	PRESSURE DROP		GPM	CFM	EWT			
					Cooling 86 F		Heating 68 F	
	PSI	Ft			TC	EER Btuh/W	TC	COP
006	1.7	3.9	1.50	180	5,400	12.8	7,400	4.2
009	2.9	6.7	2.25	300	8,100	12.8	10,300	4.3
012	8.1	18.7	3.00	375	11,800	12.7	14,600	4.2
015	6.8	15.7	3.75	500	14,100	13.3	16,800	4.6
019	5.6	12.8	4.50	600	18,900	12.5	22,500	3.2
024	5.8	13.5	6.00	800	23,000	12.3	27,600	4.2
030	3.3	7.6	7.50	1000	28,500	13.2	33,300	4.4
036	2.9	6.8	9.00	1200	34,000	13.0	41,700	4.2
042	3.8	8.8	10.50	1400	40,000	13.0	46,700	4.3
048	5.4	12.4	12.00	1600	47,000	12.8	58,000	4.2
060	7.9	18.2	15.00	2000	59,000	12.8	68,000	4.2

LEGEND

ARI — Air Conditioning and Refrigeration Institute
COP — Coefficient Performance
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature
TC — Total Capacity

NOTES:
1. A water-to-air heat pump using water or brine circulating in a common piping loop functioning as a heat source/heat sink.
2. The temperature of the water or brine loop is usually mechanically controlled within a temperature range of 60 F to 90 F.
3. Certified in accordance with the ARI/ISO Standard 13256-1 Certification Program, which replaces ARI Standard-320.
4. Size 006 available as RHR unit only.

50RHR,50RVR UNIT GROUND LOOP APPLICATIONS

UNIT 50RHR,RVR	PRESSURE DROP		GPM	CFM	EWT			
					Cooling 77 F		Heating 32 F	
	PSI	Ft			TC	EER Btuh/W	TC	COP
006	1.7	3.9	1.50	180	5,600	14.3	4,400	3.4
009	2.9	6.7	2.25	300	8,300	14.2	6,200	3.4
012	8.1	18.7	3.00	375	12,100	14.2	8,700	3.4
015	6.8	15.7	3.75	500	14,500	14.8	10,700	3.5
019	5.6	12.8	4.50	600	19,100	13.4	11,800	3.2
024	5.8	13.5	6.00	800	23,000	13.3	16,700	3.3
030	3.3	7.6	7.50	1000	28,700	14.4	20,100	3.4
036	2.9	6.8	9.00	1200	35,200	14.7	25,500	3.4
042	3.8	8.8	10.50	1400	42,000	15.0	29,400	3.4
048	5.4	12.4	12.00	1600	48,500	14.3	35,300	3.3
060	7.9	18.2	15.00	2000	60,600	14.1	44,000	3.2

LEGEND

ARI — Air Conditioning and Refrigeration Institute
COP — Coefficient Performance
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature
TC — Total Capacity

NOTES:
1. A brine-to-air heat pump using a brine solution circulating through a subsurface piping loop functioning as a heat source/heat sink.
2. The heat exchange loop may be placed in horizontal trenches or vertical bores, or be submerged in a body of surface water.
3. The temperature of the brine is related to the climatic conditions and may vary from 20 F to 110 F.
4. Certified in accordance with the ARI/ISO Standard 13256-1 Certification Program, which replaces ARI Standard-330.
5. Size 006 available as RHR unit only.

50RHR,50RVR UNIT GROUND WATER APPLICATIONS

UNIT 50RHR,RVR	PRESSURE DROP		GPM	CFM	EWT			
					Cooling 59 F		Heating 50 F	
	PSI	Ft			TC	EER Btuh/W	TC	COP
006	1.7	3.9	1.50	180	5,900	17.6	5,500	3.8
009	2.9	6.7	2.25	300	8,800	17.6	7,700	3.8
012	8.1	18.7	3.00	375	12,500	17.6	11,000	3.6
015	6.8	15.7	3.75	500	15,200	17.6	13,500	4.1
019	5.6	12.8	4.50	600	20,100	17.6	16,700	3.4
024	5.8	13.5	6.00	800	26,100	18.2	21,300	3.7
030	3.3	7.6	7.50	1000	31,100	18.3	27,000	3.9
036	2.9	6.8	9.00	1200	37,500	18.2	33,400	3.9
042	3.8	8.8	10.50	1400	46,500	18.6	38,300	3.9
048	5.4	12.4	12.00	1600	54,000	18.1	46,000	3.8
060	7.9	18.2	15.00	2000	64,500	16.8	56,000	3.8

LEGEND

ARI — Air Conditioning and Refrigeration Institute
COP — Coefficient Performance
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature
TC — Total Capacity

NOTES:
1. A water-to-air heat pump using water pumped from a well, lake or stream functioning as a heat source/heat sink.
2. The temperature of the water is related to the climatic conditions and may vary from 40 F to 80 F.
3. Certified in accordance with the ARI/ISO Standard 13256-1 Certification Program, which replaces ARI Standard-325.
4. Size 006 available as RHR unit only.

ARI/ISO capacity notes

1. Cooling capacities based upon 80.6 F DB (dry bulb), 66.2 F WB (wet bulb) entering-air temperature.
2. Heating capacities based upon 68 F DB, 59 F WB entering-air temperature.
3. All ratings based upon 208-v operation.

Physical data

PHYSICAL DATA — AQUAZONE™ 50RHR,RVR006-060 UNITS

UNIT 50RHR,RVR	006*	009	012	015	019	024	030	036	042	048	060
NOMINAL CAPACITY (Btuh)	5,400	8,100	11,800	14,100	18,900	23,000	28,500	34,000	40,000	47,000	59,000
COMPRESSOR (1 each)	Rotary				Reciprocating						Scroll
FACTORY CHARGE R-22 (oz)	12	15	15	30	30	30	41	44	46	54	80
PSC FAN MOTOR AND BLOWER											
Fan Motor Type/Speeds	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3
Fan Motor (Hp)	1/25	1/10	1/10	1/6	1/5	1/3	1/2	3/4	3/4	3/4	1
Blower Wheel Size (D x W) (in.)	5 x 5	5 x 5	6 x 5	9 x 7	9 x 7	9 x 7	9 x 7	10 x 10	10 x 10	10 x 10	11 x 10
WATER CONNECTION SIZE (FPT) (in.)	1/2	1/2	1/2	3/4	3/4	3/4	3/4	3/4	1	1	1
VERTICAL											
Air Coil											
Dimensions (H x W) (in.)	10 x 16			16 x 16			20 x 20		28 x 20		28 x 25
Total Face Area (sq ft)	1.1			1.8			2.8		3.9		4.9
Tube Size (in.)	3/8			3/8			3/8		3/8		3/8
Fin Spacing (FPI)	12			12			12		12		10
Number of Rows	3			3			3		3		4
Filter Standard 1-in. Throwaway (Size)	10 x 20			16 x 20			20 x 24		28 x 24		28 x 30
Weight (lb)											
Operating	—	112	121	147	169	193	219	229	257	267	323
Packaged	—	122	131	157	179	203	231	241	269	279	338
HORIZONTAL											
Air Coil											
Dimensions (H x W) (in.)	10 x 16			16 x 16			18 x 22		18 x 31		20 x 35
Total Face Area (sq ft)	1.1			1.8			2.8		3.9		4.9
Tube Size (in.)	3/8			3/8			3/8		3/8		3/8
Fin Spacing (FPI)	12			12			12		12		10
Number of Rows	2	2	3	3			3		3		4
Filter Standard 1-in. Throwaway (Qty — Size)	1 — 10 x 20			1 — 16 x 20			1 — 18 x 24		2 — 18 x 18		1 — 12 x 20 1 — 25 x 20
Weight (lb)											
Operating	110	112	121	147	169	193	219	229	257	267	323
Packaged	120	122	131	157	179	203	231	241	269	279	338

LEGEND

PSC — Permanent Split Capacitor

*Size 006 available in 50RHR unit only.

NOTES:
1. All units have spring compressor mountings, TXV (thermostatic expansion valve) expansion devices, and 1/2- and 3/4-in. electrical knockouts.
2. Size 048 available as high-static unit.

Options and accessories

DESCRIPTION	FACTORY-INSTALLED OPTIONS	FIELD-INSTALLED OPTIONS
Cupronickel Heat Exchangers	X	
Sound Attenuation Package (Mute Package)	X	
Extended Range	X	
High-Static Blower (size 048 only)	X	
Water Circuit Options	X	
Two-Way Motorized Control Valve	X	
Deluxe D Control System	X	
PremierLink™ Controller	X	
Aquazone™ Thermostats		X
Loop Controller		X
Filter Rack (2 in.)		X
Fire-Rated Hoses		X
Ball Valves		X
Y strainers		X
Solenoid Valves		X
Hose Kit Assemblies		X
Remote Sensors		X
PremierLink Accessories		X

Factory-installed options

Cupronickel heat exchangers are available for higher corrosion protection for applications such as open tower, geothermal, etc. Consult the water quality guidelines for proper application and selection of this option.

Sound attenuation package (mute package) is available for applications that require especially low noise levels. With this option, a double application of sound attenuating material is applied, access panels are double dampened with $^1/_2$-in. thick density fiberglass insulation, and a unique application of special dampening material is applied to the curved portion of the blower. The mute package in combination with standard unit noise reduction features (i.e., as mentioned previously) provides sound levels and noise reduction to the highest degree.

Extended range is provided to insulate the coaxial coil to prevent condensation, and therefore potential dripping problems, in applications where the entering water temperature is below the normal operating range (less than 60 F).

High-static blower is available on size 048 for the 50RHR,RVR units. This option specifically provides increased airflow at various static pressure conditions, to provide even more flexibility to the high blower performance in the standard offering for each model number.

Deluxe D control system provides the same functions as the Complete C control system while incorporating additional flexibility and functions to include:

Thermostat input capabilities accommodate emergency shutdown mode and night setback with override (NSB) potential. Night setback from low temperature thermostat with 2-hour override is initiated by a momentary signal from the thermostat.

Compressor relay staging is used with dual stage units (units with 2 compressors and 2 Deluxe D controls) or in master/slave applications.

Boilerless electric heat control system allows automatic changeover to electric heat at low loop water temperature.

Intelligent reversing valve operation minimizes reversing valve operation for extended life and quiet operation.

Thermostat type select (Y, O or Y, W) provides the ability to work and select heat pump or heat/cool thermostats (Y, W).

Reversing valve signal select (O or B) provides selection for heat pump O/B thermostats.

Dehumidistat input provides operation of fan control for dehumidification operation.

Multiple units on one thermostat/wall sensor provides for communication for up to three heat pumps on one thermostat.

Boilerless changeover temperature provides the selection of boilerless changeover temperature set point.

Accessory relays allow configuration for multiple applications including fan and compressor cycling, digital night setback (NSB), mechanical night setback, water valve operation, and outside air damper operation.

PremierLink controller is compatible with the Carrier Comfort Network® (CCN) and other building automation systems (BAS). This control is designed to allow users the access and ability to change factory-defined settings thus expanding the function of the standard unit.

Water circuit options provide internally mounted 2.5 or 3.0 gpm per ton automatic flow regulating valves for easier installation.

Two-way motorized control valve can be provided with a copper heat exchanger for applications involving open type systems or variable speed pumping. This valve will slowly open and close in conjunction with the compressor operation to shut off or turn on water to the unit.

Options and accessories (cont)

Field-installed accessories

Carrier's line of Aquazone™ thermostats are both attractive and multi-functional, accommodating stand-alone water source heat pump installations.

Programmable 7-day thermostat offers 2-stage heat, 2-stage cool, auto changeover, 7-day programmable with copy command, 4 settings per day, fully electronic, 24 vac, backlit LCD, keypad lockout, no batteries required, 5-minute compressor protection, NEVERLOST™ memory, 3 security levels, and temperature display in degrees F or C.

Programmable 7-day light-activated thermostat offers the same features as the 7-day programmable thermostat and includes occupied comfort settings with lights on, unoccupied energy savings with lights off.

Programmable 7-day flush-mount thermostat offers the same features as the 7-day programmable thermostat and includes locking coverplate with tamper proof screws, flush to wall mount, holiday/vacation programming, set point limiting, dual point with adjustable deadband, O or B terminal, and optional wall or duct-mounted remote sensor.

Programmable 5-day thermostat offers 2-stage heat, 2-stage cool, auto changeover, 5-minute built-in compressor protection, locking cover included, temperature display in degrees F or C, keypad lockout, backlit display, 5-1-1 programming, O or B terminal, dual set point with adjustable deadband, configurable display, self-prompting program, and 4 settings per day.

Non-programmable thermostat offers 2 heat stages, 2 cool stages, auto changeover, 5-minute built in compressor protection, locking cover included, temperature display in degrees F or C, keypad lockout, large display, backlit display, O or B terminal, dual set point with adjustable deadband, and backplate with terminals.

Loop controller with six stages (2 stages for heating and 4 stages for heat rejection) includes:

- Loop temperature alarms
- Two pump single loop flow monitoring with the ability to manually select the lead pump
- One common alarm signal and indicating light and one audible alarm
- Loop water temperature sensor test circuit
- Functional test simulation from operator keypad
- Real timeclock, industrial noise ratings
- Loop water temperature control switch

Filter rack (2 in.) is available in place of the standard 1-in. return air filter to enhance the filtration system of the water source heat pump. The 2-in. filter rack does not include filters.

Fire-rated hoses are 2 ft long and have a fixed MPT on one end and a swivel with an adapter on the other end. Hose kits are provided with both a supply and return hose and can be either stainless steel or galvanized. Five sizes are available ($1/2$, $3/4$, 1, $1\,1/4$, $1\,1/2$ in.).

Ball valves (brass body) are used for shutoff and balancing water flow and are available with memory, memory stop, and pressure temperature ports. Valves consist of UL-listed brass body, ball and stem type with Teflon* seats and seals. Five sizes are available ($1/2$, $3/4$, 1, $1\,1/4$, $1\,1/2$ in.).

Y strainers (bronze body) are "Y" type strainers with a brass cap. With a maximum operating pressure rating of 450 psi, the strainer screen is made of stainless steel. Strainers are available with blow down valves. Five sizes are available ($1/2$, $3/4$, 1, $1\,1/4$, $1\,1/2$ in.).

Solenoid valves (brass body) offer 3.5 watt coil, 24 volt, 50/60 Hz, 740 amps inrush, and .312 amp holding. Valves operate slowly for quiet system application. Five sizes are available ($1/2$, $3/4$, 1, $1\,1/4$, $1\,1/2$ in.).

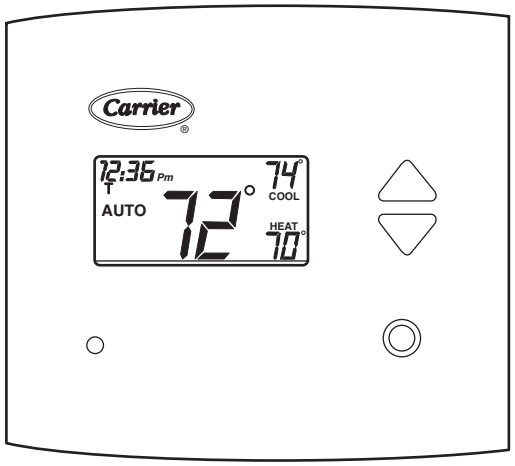
Hose kit assemblies provide all the necessary components to hook up a water-side system. Supply hose includes a ported ball valve with pressure temperature (P/T) plug ports, flexible stainless steel hose with swivel and nipple. Return hose includes a ball valve, preset automatic balancing valve (gpm) with two P/T ports, flexible stainless steel hose with a swivel and nipple, balancing valve, and low-pressure drop water control valve.

Remote sensors are available for Aquazone™ flush mount thermostats. Available sensors are for wall (wired and wireless) or duct mounted applications.

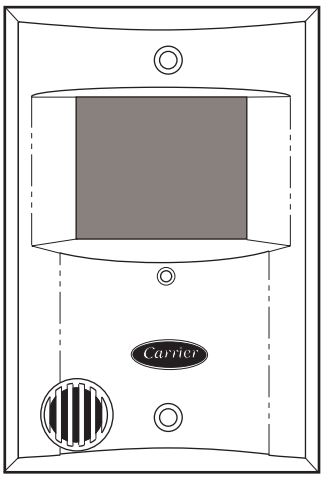
PremierLink™ accessories are available for providing a fully integrated WSHP DDC system. Accessories include supply air temperature sensors (with override and/or set-point adjustment), communicating room sensors, CO_2 sensors (for use in demand control ventilation), and linkage thermostats (to control multiple units from one thermostat).

*Teflon is a trademark of E. I. du Pont de Nemours and Company.

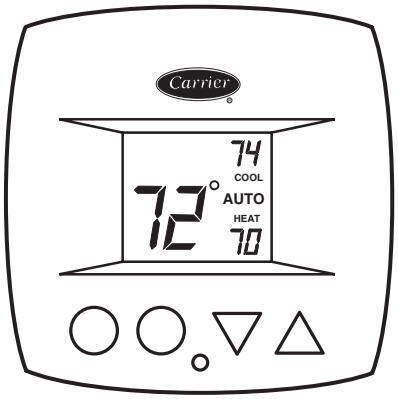
CARRIER AQUAZONE™ THERMOSTATS



7-DAY PROGRAMMABLE/LIGHT-ACTIVATED PROGRAMMABLE

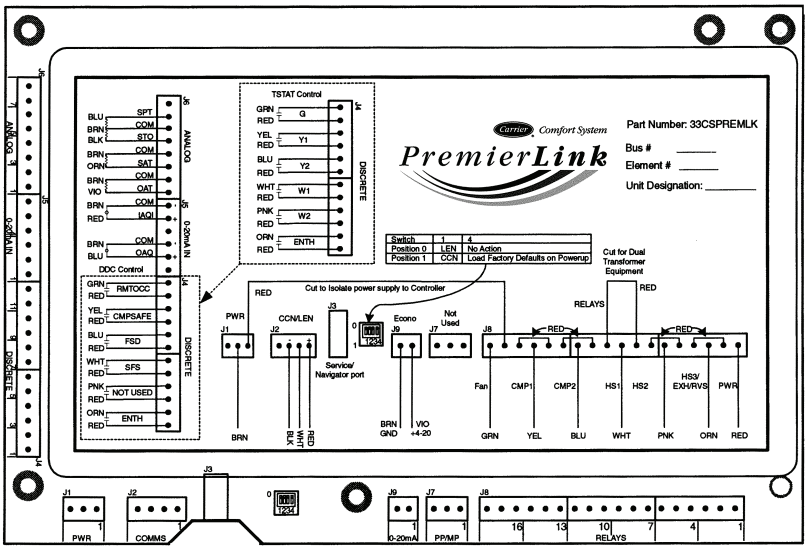


7-DAY PROGRAMMABLE FLUSH MOUNT



5-DAY PROGRAMMABLE/NON-PROGRAMMABLE

PREMIERLINK™ COMMUNICATING CONTROL

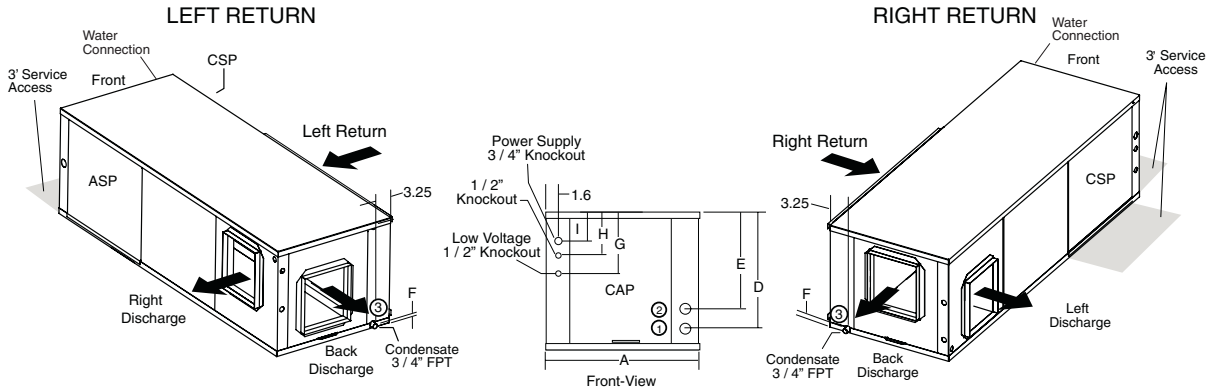


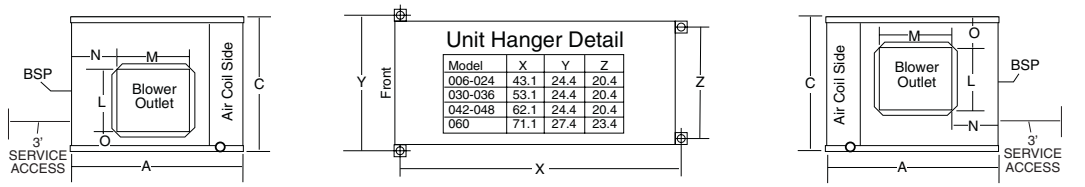
Dimensions

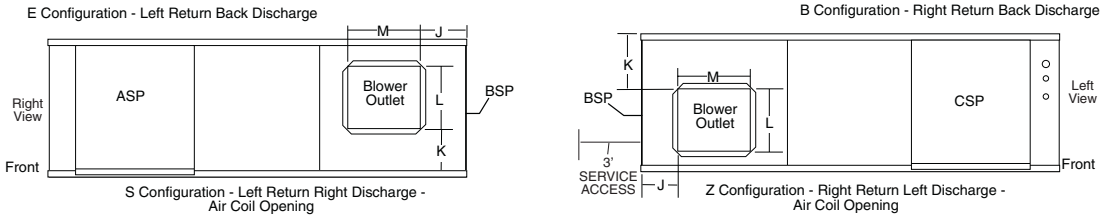
50RHR006-060 UNITS

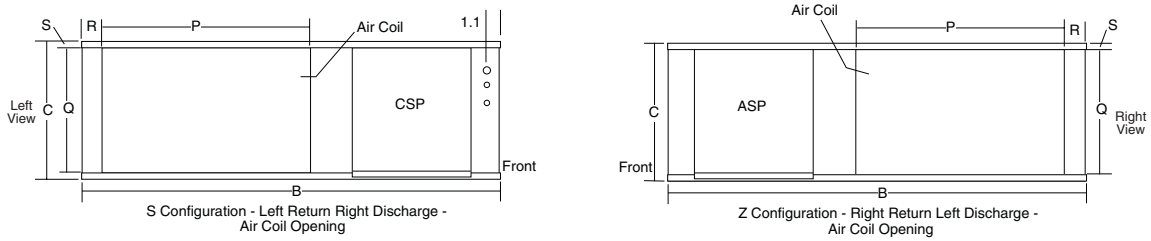
50RHR UNITS		OVERALL CABINET			WATER CONNECTIONS				ELECTRICAL KNOCKOUTS (in.)			DISCHARGE CONNECTION DUCT FLANGE INSTALLED (±0.10 IN.)						RETURN CONNECTION USING RETURN AIR OPENING			
					1	2	3	Loop Water FPT	G 1/2 conduit	H 1/2 conduit	I 3/4 conduit										
		A Width	B Depth	C Height	D In	E Out	F Cond-ensate		Low Voltage	Ext Pump	Power Supply	J	K	L Supply Height	M Supply Width	N	O	P Return Depth	Q Return Height	R	S
006-012	in.	22.4	43.1	11.3	2.4	5.4	0.6	1/2	3.5	5.5	8.2	5.8	4.0	5.8	8.0	5.8	1.5	17.1	9.3	2.2	1.0
	cm	56.8	109.5	28.7	6.1	13.7	1.5		8.9	14.0	20.8	14.7	10.2	14.7	20.3	14.7	3.8	43.4	23.6	5.6	2.5
015-024	in.	22.4	43.1	17.3	2.4	4.9	0.6	3/4	3.5	7.5	10.2	5.0	5.6	10.4	9.3	5.0	1.5	17.1	15.3	2.2	1.0
	cm	56.8	109.5	43.9	6.1	12.4	1.5		8.9	19.1	25.9	12.7	14.2	26.4	23.6	12.7	3.8	43.4	38.9	5.6	2.5
030	in.	22.4	53.2	19.3	2.4	5.4	0.6	3/4	5.7	9.7	12.2	5.0	6.8	10.4	9.3	5.0	2.1	23.1	17.3	2.2	1.0
	cm	56.8	135.1	49.0	6.1	13.7	1.5		14.5	24.6	31.0	12.7	17.3	26.4	23.6	12.7	5.3	58.7	43.9	5.6	2.5
036	in.	22.4	53.2	19.3	2.4	5.4	0.6	3/4	5.7	9.7	12.2	2.9	3.8	13.5	13.1	2.9	1.9	23.1	17.3	2.2	1.0
	cm	56.8	135.1	49.0	6.1	13.7	1.5		14.5	24.6	31.0	7.4	9.7	34.3	33.3	7.4	4.8	58.7	43.9	5.6	2.5
042-048	in.	22.4	62.2	19.3	2.4	5.4	0.6	1	5.7	9.7	12.2	2.9	3.8	13.5	13.1	2.9	1.9	32.1	17.3	2.2	1.0
	cm	56.8	158.0	49.0	6.1	13.7	1.5		14.5	24.6	31.0	7.4	9.7	34.3	33.3	7.4	4.8	81.5	43.9	5.6	2.5
060	in.	25.4	71.2	21.3	2.4	5.4	0.6	1	8.1	11.7	14.2	5.8	5.0	13.6	13.3	4.2	2.9	36.1	19.3	2.2	1.0
	cm	64.5	180.8	54.1	6.1	13.7	1.5		20.6	29.7	36.1	14.7	12.7	34.5	33.8	14.7	7.4	91.7	49.0	5.6	2.5

NOTES:
1. Condensate is 3/4-in. FPT copper.
2. Horizontal unit shipped with filter bracket only. This bracket should be removed for return duct connection.
3. Hanger kit is factory installed. Isolation grommets are provided.
4. Right and left orientation is determined by looking at water connection side.









AIRFLOW CONFIGURATION		
Code	Return	Discharge
S	Left	Right
E	Left	Back
Z	Right	Left
B	Right	Back

LEGEND

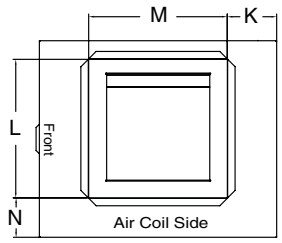
ASP — Alternate Service Panel
BSP — Blower Service Panel
CAP — Control Access Panel
CSP — Compressor Service Panel

50RVR009-060 UNITS

50RVR UNIT		OVERALL CABINET			WATER CONNECTIONS				ELECTRICAL KNOCKOUTS (in.)			DISCHARGE CONNECTION DUCT FLANGE INSTALLED (±0.10 IN.)					RETURN CONNECTION USING AIR COIL OPENING			
					1	2	3	Loop Water FPT	G 1/2 conduit	H 1/2 conduit	I 3/4 conduit									
		A Width	B Depth	C Height	D In	E Out	F Cond-ensate		Low Voltage	Ext Pump	Power Supply	J	K	L Supply Height	M Supply Depth	N	O	P Return Depth	Q Return Height	R
009-012	in.	22.4	21.6	22.6	2.6	5.4	7.8	1/2	3.5	5.5	8.2	10.6	6.8	5.8	8.0	6.0	2.2	17.1	9.3	1.0
	cm	56.8	54.9	57.4	6.6	13.7	19.8		8.9	14.0	20.8	26.9	17.3	14.7	20.3	15.2	5.6	43.4	23.6	2.5
015-024	in.	22.4	21.6	34.6	2.4	4.8	8.5	3/4	3.5	7.5	10.2	7.2	3.8	14.0	14.0	4.3	2.2	17.1	15.3	1.0
	cm	56.8	54.9	87.9	6.1	12.2	21.6		8.9	19.1	25.9	18.3	9.7	35.6	35.6	10.9	5.6	43.4	38.9	2.5
030	in.	22.4	25.6	40.6	2.4	5.4	9.7	3/4	5.7	9.7	12.2	7.2	5.8	14.0	14.0	4.3	2.2	21.1	19.2	1.0
	cm	56.8	65.1	103.1	6.1	13.7	24.6		14.5	24.6	31.0	18.3	14.7	35.6	35.6	10.9	5.6	53.6	48.8	2.5
036	in.	22.4	25.6	40.6	2.4	5.4	9.7	3/4	5.7	9.7	12.2	7.2	5.8	14.0	14.0	4.3	2.2	21.1	19.2	1.0
	cm	56.8	65.1	103.1	6.1	13.7	24.6		14.5	24.6	31.0	18.3	14.7	35.6	35.6	10.9	5.6	53.6	48.8	2.5
042-048	in.	22.4	25.6	48.6	2.4	5.4	9.7	1	5.7	9.7	12.2	7.2	5.8	14.0	14.0	4.3	2.2	21.1	27.2	1.0
	cm	56.8	65.1	123.4	6.1	13.7	24.6		14.5	24.6	31.0	18.3	14.7	35.6	35.6	10.9	5.6	53.6	69.1	2.5
060	in.	25.4	30.6	50.6	2.4	5.4	10.7	1	8.1	11.7	14.2	6.2	6.3	18.0	18.0	5.1	2.2	26.1	27.2	1.0
	cm	64.5	77.8	128.5	6.1	13.7	27.2		20.6	29.7	36.1	15.7	16.0	45.7	45.7	13.0	5.6	66.3	69.1	2.5

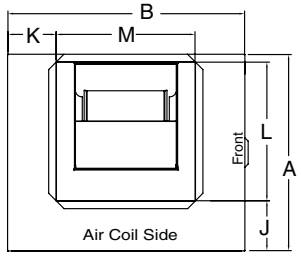
NOTES:
1. Condensate is 3/4-in. FPT and is switchable from side to front.
2. Vertical unit shipped with filter bracket only extending from unit 2.5 inches. This bracket should be removed when connecting return duct.
3. Discharge flange field installed.
4. Right and left orientation is determined by looking at water connection side.

RIGHT RETURN

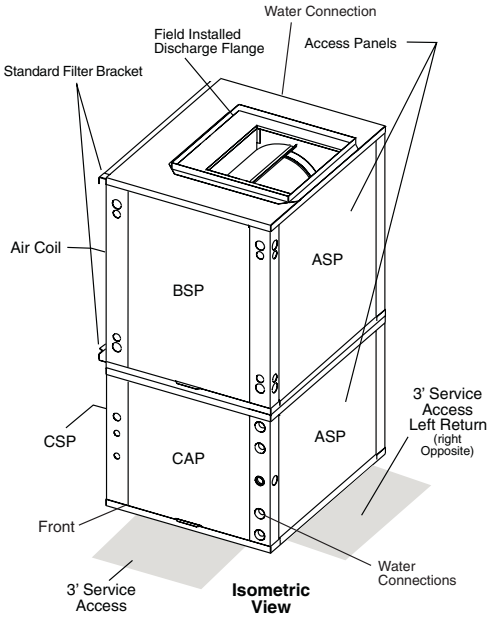


R Configuration - Top View-Right Return

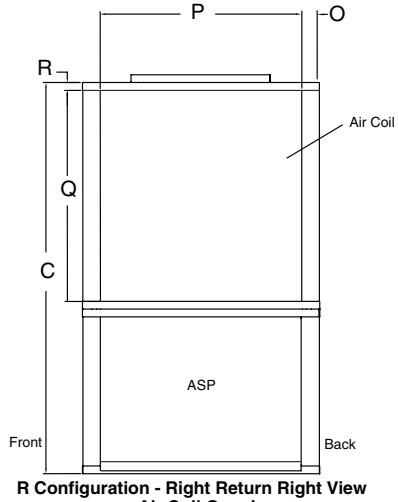
LEFT RETURN



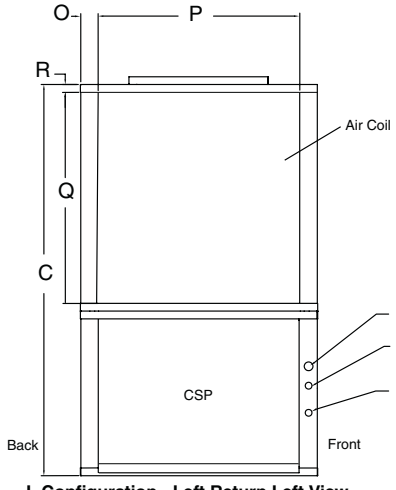
L Configuration - Top View-Left Return



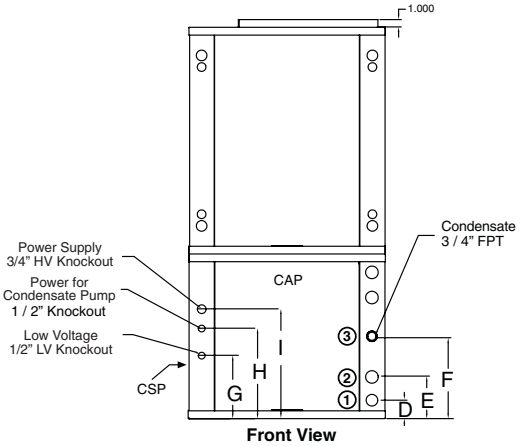
Isometric View



R Configuration - Right Return Right View - Air Coil Opening



L Configuration - Left Return Left View - Air Coil Opening



Front View

AIRFLOW CONFIGURATION		
Code	**Return**	**Discharge**
L	Left	Top
R	Right	Top

LEGEND

ASP — Alternate Service Panel
BSP — Blower Service Panel
CAP — Control Access Panel
CSP — Compressor Service Panel

Selection procedure (with 50RHR024 example)

I Determine the actual cooling and heating loads at the desired dry bulb (db) and wet bulb (wb) conditions.

Assume cooling load at desired dry bulb 80 F and wet bulb 65 F conditions are as follows:

Given:

Total Cooling (TC). . . . . .22,100 Btuh

Sensible Cooling (SC) . . . . . .16,500 Btuh

Entering-Air Temperature db . . . . . 80 F

Entering-Air Temperature wb . . . . . .65 F

II Determine the following design parameters.

Determine entering water temperature, water flow rate (gpm), airflow (cfm), water flow pressure drop and design wet and dry bulb temperatures. Airflow cfm should be between 300 and 450 cfm per ton. Unit water pressure drop should be kept as close as possible to across units to make water balancing easier. Enter the 50RHR024 Performance Data table and find the proper indicated water flow and water temperature.

For example:

Entering Water Temp . . . . . 90 F

Water Flow (Based upon 12 F rise in temp) . . . . . .4.5 gpm

Airflow cfm . . . . . .700 cfm

III Select a unit based on total cooling and total sensible cooling conditions. Unit selected should be closest to but not larger than the actual cooling load.

Enter tables at the design water flow and water temperature. Read the total and sensible cooling capacities.

NOTE: Interpolation is permissible, extrapolation is not.

For example:

Enter the 50RHR024 performance table at design water flow and water temperature. Read total cooling, sensible cooling and heat of rejection capacities:

Total Cooling . . . . . .21,900 Btuh

Sensible Cooling . . . . . 16,700 Btuh

Heat of Rejection . . . . . .29,000 Btuh

Read the heat capacity. If the heat capacity exceeds the design criteria, it is acceptable.

NOTE: It is quite normal for water source heat pumps to be selected on cooling capacity only since the heating output is usually greater than the cooling capacity.

IV Determine the correction factors associated with the variable factors of dry bulb and wet bulb using the Correction Factors tables found in this book.

Using the following formulas to determine the correction factors of dry bulb and wet bulb:

a) Corrected Total Cooling = tabulated total cooling x wet bulb correction x airflow correction.

b) Corrected Sensible Cooling = tabulated sensible cooling x wet/dry bulb correction x airflow correction

V Determine entering air and airflow correction using the Correction Factors tables found in this book.

The nominal airflow for 50RHR024 is 800 cfm. The design parameter is 700 cfm.

800/700 = 88% of nominal airflow

Use the 88% row in the Nominal Cfm Correction Factors table.

The entering-air temperature wb is 65 F. Use the 65 F row in the Entering Air Correction Factors table.

Using the following formulas to determine the correction factors of entering air and airflow correction:

	Table		Ent Air		Airflow		Corrected
Corrected Total Cooling	= 21,900	x	0.971	x	0.985	=	20,946
Corrected Sensible Cooling	= 16,700	x	1.070	x	0.938	=	16,761
Corrected Heat of Rejection	= 29,000	x	0.969	x	0.983	=	26,358

Compare the corrected capacities to the load requirements established in Step I. If the capacities are within 10% of the load requirements, the equipment is acceptable. It is better to undersize than oversize as undersizing improves humidity control, reduces sound levels and extends the life of the equipment.

VI Calculate and assess water temperature rise.

Calculate the water temperature rise and assess the selection using the following calculation:

$$\text{Actual Temperature Rise} = \frac{\text{Correction Heat of Rejection}}{\text{GPM x 500}}$$

For example, using the Corrected Heat of Rejection from the last step:

$$\text{Actual Temperature Rise} = \frac{26{,}358}{4.5 \times 500} = 11.7 \text{ F}$$

If the units selected are not within 10% of the load calculations, review what effect changing the gpm, water temperature and/or airflow will have on the corrected capacities. If the desired capacity cannot be achieved, select the next larger or smaller unit and repeat Steps I through VI.

VII ARI/ISO/ASHRAE 13256-1 Conversion

Performance standard ARI/ISO/ASHRAE 13256-1 became effective on January 1, 2000 and replaced the existing ARI Standards 320 Water-Loop Heat Pumps (WLHP), 325 Ground-Water Heat Pumps (GWHP), and 330 Ground-Loop Heat Pumps (GLHP).

The ARI/ISO Standard incorporates a consistent rating methodology for including fan and pump energy for calculating cooling capacity, heating capacity, and energy efficiency ratios (EER). This simplifies the use of rating data for heat pump performance modeling in seasonal energy analysis calculations, and allows for direct rating comparisons across applications.

a) ISO capacity and efficiency equations

The following equations are used to calculate and correct cooling capacity, heating capacity, and respective EER:

ISO cooling capacity = (cooling capacity in Btuh) + (fan power correction in Watts x 3.412)

ISO Cooling EER = (ISO cooling capacity in Btuh/3.412)/(power input in watts – fan power correction in watts + pump power correction in watts) = watts/watts

NOTE: Do not divide ISO cooling capacity by 3.412 to obtain Btuh/watts.

ISO heating capacity = (heating capacity in Btuh) – (fan power correction in watts x 3.412)

ISO heating EER = (ISO heating capacity in Btuh/3.412)/(power input in watts – fan power correction in watts + pump power correction in watts) = watts/watts

NOTE: Do not divide ISO heating capacity by 3.412 to obtain Btuh/watts.

Refer to English to SI conversion table in this book.

b) Identify the design conditions corrected for air and water conditions.

Airflow cfm = 700 Cfm

Water flow
(Based upon 12 F rise in temp) = 4.5 gpm

External static pressure = 0.4 in. wg

Water pressure drop = 7.9 ft of head

Power input = 2,060 watts

Cooling capacity = 20,946 Btuh

c) Perform fan power correction adjustment

Use the following formula to calculate fan power correction:

Fan power correction = (cfm x 0.472) x (external static pressure x 249)/300 = watts
= (700 x 0.472) x (0.4 x 249)/300
= 110 watts

d) Perform pump power correction adjustment

Use the following formula to calculate pump power correction:

Pump power correction = (gpm x 0.0631) x (pressure drop x 2,990)/300
= Watts
= (4.5 x 0.0631) x (7.9 x 2,990)/300
= 22 watts

e) Perform capacity and EER calculations

Use the following formula to calculate capacity and EER:

ISO cooling capacity = (cooling capacity) + (fan power correction x 3.412)
= 20,946 + (110 x 3.412)
= 21,321 Btuh

f) Perform corrections by using the ISO equations

ISO EER = (ISO cooling capacity/3.412)/(power input – fan power correction + pump power correction)
= watts/watts

NOTE: Do not divide ISO cooling capacity by 3.412 to obtain Btuh/watts.

= (21,321/3.412)/(2,060 – 110 + 22)
= 3.27 watts/watts x 3.412 Btuh/watts
= 10.81 Btuh/watts

Performance data

50RHR006 UNIT PERFORMANCE
200 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	1.5	1.6	3.6	Operation Not Recommended				4.8	0.47	3.2
30	0.8	0.6	1.3	7.4	4.8	0.23	8.2	5.1	0.52	3.3
	1.1	1.0	2.3	7.6	4.9	0.22	8.3	5.2	0.50	3.5
	1.5	1.5	3.5	7.8	5.0	0.21	8.5	5.4	0.49	3.7
40	0.8	0.6	1.3	7.1	4.7	0.29	8.1	5.6	0.53	3.8
	1.1	1.0	2.2	7.3	4.8	0.28	8.3	5.8	0.52	4.0
	1.5	1.5	3.4	7.5	4.8	0.27	8.4	6.0	0.51	4.2
50	0.8	0.5	1.3	6.9	4.5	0.36	8.1	6.2	0.55	4.3
	1.1	0.9	2.1	7.0	4.6	0.34	8.2	6.3	0.54	4.5
	1.5	1.4	3.3	7.2	4.7	0.33	8.3	6.5	0.52	4.8
60	0.8	0.5	1.2	6.6	4.4	0.42	8.0	6.7	0.57	4.8
	1.1	0.9	2.1	6.8	4.5	0.40	8.1	6.9	0.55	5.0
	1.5	1.4	3.2	6.9	4.5	0.39	8.2	7.1	0.54	5.3
70	0.8	0.5	1.2	6.3	4.2	0.48	8.0	7.2	0.58	5.2
	1.1	0.9	2.0	6.5	4.3	0.46	8.1	7.5	0.57	5.5
	1.5	**1.3**	**3.1**	6.6	4.4	0.44	8.2	**7.7**	**0.56**	**5.8**
80	0.8	0.5	1.1	6.1	4.1	0.55	7.9	7.8	0.60	5.7
	1.1	0.8	1.9	6.2	4.2	0.53	8.0	8.0	0.59	6.0
	1.5	1.3	3.0	6.4	4.2	0.50	8.1	8.2	0.57	6.3
90	0.8	0.5	1.1	5.8	3.9	0.61	7.9	8.3	0.62	6.2
	1.1	0.8	1.9	5.9	4.0	0.59	7.9	8.6	0.60	6.5
	1.5	1.3	2.9	6.1	4.1	0.56	8.0	8.8	0.59	6.8
100	0.8	0.5	1.1	5.5	3.8	0.67	7.8	Operation Not Recommended		
	1.1	1.8	1.8	5.7	3.9	0.65	7.9			
	1.5	1.2	2.8	5.8	3.9	0.62	7.9			
110	0.8	0.4	1.0	5.3	3.6	0.74	7.8			
	1.1	0.7	1.7	5.4	3.7	0.71	7.8			
	1.5	1.2	2.7	5.5	3.8	0.68	7.8			

LEGEND

ARI — Air Conditioning and Refrigeration Institute
EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (**bold** printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 60 F EWT requires optional insulated water circuit.
6. Operation below 40 F EWT is based upon 15% antifreeze solution.
7. See Correction Factors tables for operating conditions other than those listed above.
8. Performance capacities shown in thousands of Btuh.

50RHR,RVR009 UNIT PERFORMANCE
300 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	2.2	3.6	8.3	Operation Not Recommended				5.5	0.63	3.4
30	1.1	1.2	2.8	10.6	7.0	0.40	12.0	5.9	0.62	3.8
	1.7	2.4	5.6	10.9	7.1	0.38	12.2	6.2	0.64	4.0
	2.2	3.5	8.0	11.1	7.2	0.36	12.4	6.5	0.66	4.3
40	1.1	1.2	2.7	10.1	6.8	0.47	11.7	6.8	0.65	4.6
	1.7	2.4	5.5	10.3	6.9	0.45	11.8	7.2	0.67	4.9
	2.2	3.4	7.8	10.6	7.0	0.43	12.0	7.5	0.69	5.2
50	1.1	1.1	2.6	9.5	6.5	0.53	11.3	7.7	0.68	5.4
	1.7	2.3	5.3	9.7	6.7	0.51	11.5	8.1	0.70	5.7
	2.2	3.3	7.6	10.0	6.8	0.49	11.6	8.5	0.71	6.1
60	1.1	1.1	2.5	9.0	6.3	0.60	11.0	8.6	0.71	6.2
	1.7	2.2	5.1	9.2	6.5	0.58	11.1	9.1	0.72	6.6
	2.2	3.2	7.3	9.4	6.6	0.55	11.3	9.5	0.74	7.0
70	1.1	1.1	2.4	8.4	6.1	0.67	10.7	9.5	0.73	7.0
	1.7	2.2	5.0	8.6	6.2	0.64	10.8	10.0	0.75	7.5
	2.2	**3.1**	**7.1**	8.8	6.4	0.61	10.9	**10.5**	**0.77**	**7.9**
80	1.1	1.0	2.4	7.9	5.9	0.74	10.4	10.4	0.76	7.8
	1.7	2.1	4.8	8.0	6.0	0.71	10.5	11.0	0.78	8.3
	2.2	3.0	6.8	8.2	6.1	0.68	10.5	11.5	0.80	8.8
90	1.1	1.0	2.3	7.3	5.7	0.80	10.1	11.3	0.79	8.7
	1.7	2.0	4.6	7.5	5.8	0.77	10.1	11.9	0.81	9.2
	2.2	2.9	6.6	7.7	5.9	0.74	10.2	12.5	0.83	9.7
100	1.1	0.9	2.2	6.8	5.5	0.87	9.7	Operation Not Recommended		
	1.7	1.9	4.5	6.9	5.6	0.84	9.8			
	2.2	2.8	6.4	7.1	5.7	0.80	9.8			
110	1.1	0.9	2.1	6.2	5.3	0.94	9.4			
	1.7	1.9	4.3	6.4	5.4	0.90	9.4			
	2.2	2.6	6.1	6.5	5.5	0.86	9.4			

LEGEND

ARI — Air Conditioning and Refrigeration Institute
EWT — Entering Water Temperature (F)
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MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (**bold** printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 60 F EWT requires optional insulated water circuit.
6. Operation below 40 F EWT is based upon 15% antifreeze solution.
7. See Correction Factors tables for operating conditions other than those listed above.
8. Performance capacities shown in thousands of Btuh.

Performance data (cont)

50RHR,RVR012 UNIT PERFORMANCE
375 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	3.0	7.1	16.5	Operation Not Recommended				7.6	0.84	4.7
30	1.5	2.5	5.7	14.3	10.1	0.57	16.2	8.2	0.85	5.3
	2.3	4.9	11.2	14.6	10.3	0.54	16.5	8.7	0.87	5.7
	3.0	6.9	11.0	15.0	10.5	0.52	16.8	9.1	0.89	6.1
40	1.5	2.4	5.6	13.8	9.8	0.65	16.0	9.6	0.89	6.6
	2.3	4.7	10.9	14.1	10.0	0.63	16.3	10.1	0.92	7.0
	3.0	6.7	15.2	14.4	10.2	0.60	16.5	10.6	0.94	7.4
50	1.5	2.3	5.4	13.3	9.6	0.74	15.8	11.0	0.94	7.8
	2.3	4.6	10.5	13.6	9.8	0.71	16.0	11.6	0.96	8.3
	3.0	6.5	15.0	13.9	10.0	0.68	16.2	12.2	0.99	8.8
60	1.5	2.3	5.2	12.8	9.3	0.82	15.6	12.4	0.98	9.1
	2.3	4.4	10.2	13.1	9.5	0.79	15.8	13.1	1.01	9.7
	3.0	6.3	14.6	13.4	9.7	0.75	15.9	13.7	1.03	10.2
70	1.5	2.2	5.0	12.3	9.1	0.90	15.3	13.8	1.03	10.3
	2.3	4.3	9.9	12.5	9.2	0.87	15.5	14.6	1.05	11.0
	3.0	6.1	**14.1**	12.8	9.4	0.83	15.7	**15.3**	**1.08**	**11.6**
80	1.5	2.1	4.9	11.7	8.8	0.99	15.1	15.2	1.07	11.6
	2.3	4.1	9.5	12.0	9.0	0.95	15.3	16.0	1.10	12.3
	3.0	5.9	13.1	12.3	9.2	0.91	15.4	16.8	1.13	13.0
90	1.5	2.0	4.7	11.2	8.6	1.07	14.9	16.6	1.12	12.8
	2.3	4.0	9.2	11.5	8.7	1.03	15.0	17.5	1.15	13.6
	3.0	5.7	13.1	11.8	8.9	0.98	15.1	18.4	1.18	14.4
100	1.5	2.0	4.5	10.7	8.3	1.16	14.7	Operation Not Recommended		
	2.3	3.8	8.9	11.0	8.5	1.11	14.8			
	3.0	5.5	12.6	11.2	8.6	1.06	14.9			
110	1.5	1.9	4.4	10.2	8.1	1.24	14.4			
	2.3	3.7	8.5	10.5	8.2	1.19	14.5			
	3.0	5.3	12.2	10.7	8.4	1.14	14.6			

LEGEND

ARI — Air Conditioning and Refrigeration Institute
EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
MBtuh — Btuh in Thousands
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (**bold** printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 60 F EWT requires optional insulated water circuit.
6. Operation below 40 F EWT is based upon 15% antifreeze solution.
7. See Correction Factors tables for operating conditions other than those listed above.
8. Performance capacities shown in thousands of Btuh.

50RHR,RVR015 UNIT PERFORMANCE
500 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	3.5	2.7	6.3	Operation Not Recommended				9.3	0.84	6.4
30	1.8	0.8	1.9	16.1	11.8	0.57	18.0	10.0	0.86	7.1
	2.6	1.7	3.9	16.3	11.9	0.52	18.1	10.3	0.87	7.4
	3.5	2.6	6.1	16.4	11.9	0.49	18.1	10.5	0.87	7.5
40	1.8	0.8	1.9	15.8	11.7	0.64	18.0	11.3	0.88	8.3
	2.6	1.6	3.8	16.0	11.8	0.59	18.0	11.7	0.89	8.6
	3.5	2.6	5.9	16.1	11.8	0.49	18.0	11.9	0.90	9.9
50	1.8	0.8	1.8	15.5	11.5	0.64	17.9	12.7	0.91	9.6
	2.6	1.6	3.7	15.7	11.6	0.59	18.0	13.2	0.91	10.1
	3.5	2.5	5.7	15.8	11.7	0.57	17.8	13.5	0.92	10.4
60	1.8	0.8	1.8	15.0	11.2	0.79	17.7	14.1	0.93	11.0
	2.6	1.5	3.5	15.3	11.3	0.74	17.8	14.7	0.94	11.5
	3.5	2.4	5.5	15.4	11.4	0.71	17.9	15.1	0.94	11.9
70	1.8	0.7	1.7	14.4	10.8	0.89	17.4	15.6	0.95	12.4
	2.6	1.5	3.4	14.8	11.0	0.83	17.6	16.2	0.96	13.0
	3.5	**2.3**	**5.4**	15.0	11.1	0.80	17.7	**16.6**	**0.96**	**13.3**
80	1.8	0.7	1.6	13.7	10.5	1.02	17.1	17.0	0.97	13.7
	2.6	1.4	3.3	14.1	10.7	0.94	17.3	17.6	0.97	14.3
	3.5	2.2	5.2	14.4	10.8	0.90	17.4	18.0	0.98	14.7
90	1.8	0.7	1.6	12.7	10.1	1.17	16.7	18.3	0.98	14.9
	2.6	1.4	3.2	13.3	10.3	1.08	17.0	18.9	0.99	15.5
	3.5	2.2	5.0	13.6	10.4	1.03	17.1	19.2	1.00	15.8
100	1.8	0.7	1.5	11.7	9.6	1.37	16.3	Operation Not Recommended		
	2.6	1.3	3.1	12.3	9.9	1.25	16.6			
	3.5	2.1	4.8	12.6	10.0	1.19	16.7			
110	1.8	0.6	1.5	10.3	9.1	1.61	15.9			
	2.6	1.3	3.0	11.1	9.4	1.47	16.1			
	3.5	2.0	4.6	11.5	9.6	1.40	16.3			

LEGEND

ARI — Air Conditioning and Refrigeration Institute
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THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (**bold** printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 60 F EWT requires optional insulated water circuit.
6. Operation below 40 F EWT is based upon 15% antifreeze solution.
7. See Correction Factors tables for operating conditions other than those listed above.
8. Performance capacities shown in thousands of Btuh.

Performance data (cont)

50RHR,RVR019 UNIT PERFORMANCE
600 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	4.5	5.6	12.9	Operation Not Recommended				11.7	1.14	7.9
30	2.3	1.7	3.9	24.3	15.7	1.01	27.7	13.1	1.18	9.1
	3.4	3.3	7.7	25.1	15.9	0.98	28.5	13.8	1.22	9.6
	4.5	5.4	12.5	26.0	16.2	0.94	29.2	14.5	1.25	10.2
40	2.3	1.6	3.8	24.1	15.4	1.14	27.9	15.6	1.29	11.2
	3.4	3.2	7.4	24.9	15.6	1.10	28.6	16.4	1.33	11.8
	4.5	5.3	12.1	25.8	15.9	1.05	29.4	17.2	1.37	12.5
50	2.3	1.6	3.7	23.3	15.0	1.26	27.5	18.1	1.40	13.3
	3.4	3.1	7.2	24.1	15.3	1.21	28.2	19.0	1.44	14.1
	4.5	5.1	11.8	24.9	15.5	1.17	28.9	19.9	1.48	14.8
60	2.3	1.5	3.5	22.0	14.6	1.38	26.7	20.5	1.51	15.4
	3.4	3.0	7.0	22.8	14.8	1.33	27.3	21.6	1.55	16.3
	4.5	4.9	11.4	23.6	15.1	1.28	28.0	22.6	1.60	17.2
70	2.3	1.5	3.4	20.5	14.1	1.50	25.7	23.0	1.61	17.5
	3.4	2.9	6.8	21.3	14.4	1.45	26.2	24.2	1.66	18.5
	4.5	**4.8**	**11.0**	22.0	14.6	1.40	26.8	**25.3**	**1.71**	**19.5**
80	2.3	1.4	3.3	19.0	13.6	1.63	24.5	25.5	1.72	19.6
	3.4	2.8	6.5	19.6	13.8	1.57	25.0	26.8	1.77	20.7
	4.5	4.6	10.6	20.3	14.1	1.51	25.5	28.1	1.83	21.8
90	2.3	1.4	3.2	17.5	13.0	1.75	23.4	27.9	1.83	21.7
	3.4	2.7	6.3	18.1	13.2	1.69	23.9	29.4	1.88	22.9
	4.5	1.4	3.2	18.7	13.4	1.62	24.3	30.8	1.94	24.2
100	2.3	1.3	3.1	16.2	12.4	1.87	22.6	Operation Not Recommended		
	3.4	2.6	6.1	16.8	12.6	1.80	23.0			
	4.5	4.3	9.9	17.4	12.8	1.74	23.3			
110	2.3	1.3	3.0	15.4	11.7	1.99	22.2			
	3.4	2.5	5.8	15.9	11.8	1.92	22.5			
	4.5	4.1	9.5	16.5	12.0	1.85	22.8			

LEGEND

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TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (**bold** printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 60 F EWT requires optional insulated water circuit.
6. Operation below 40 F EWT is based upon 15% antifreeze solution.
7. See Correction Factors tables for operating conditions other than those listed above.
8. Performance capacities shown in thousands of Btuh.

50RHR,RVR024 UNIT PERFORMANCE
800 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	6.0	9.2	21.3	Operation Not Recommended				13.4	1.34	8.9
30	3.0	2.7	6.2	29.8	19.3	1.12	33.6	13.6	1.37	8.9
	4.5	5.4	12.5	30.2	19.4	1.08	33.9	14.0	1.39	9.2
	6.0	8.9	20.6	30.7	19.6	1.03	34.2	14.4	1.42	9.5
40	3.0	2.6	6.0	28.3	19.5	1.34	32.9	16.2	1.50	11.1
	4.5	5.3	12.1	28.8	19.6	1.28	33.2	16.7	1.53	11.5
	6.0	8.7	20.0	29.2	19.8	1.23	33.4	17.2	1.56	11.8
50	3.0	2.5	5.8	27.0	18.9	1.49	32.1	19.7	1.66	14.1
	4.5	5.1	11.8	27.5	19.0	1.42	32.3	20.3	1.70	14.5
	6.0	8.4	19.4	27.9	19.2	1.36	32.5	20.9	1.73	15.0
60	3.0	2.4	5.6	25.7	18.0	1.62	31.3	23.4	1.83	17.2
	4.5	4.9	11.4	26.1	18.2	1.55	31.4	24.1	1.86	17.8
	6.0	8.1	18.8	26.5	18.3	1.48	31.6	24.9	1.90	18.4
70	3.0	2.4	5.4	24.4	17.3	1.77	30.4	26.5	1.96	19.8
	4.5	4.8	11.0	24.8	17.4	1.69	30.5	27.3	2.00	20.5
	6.0	**7.9**	**18.2**	25.1	17.5	1.62	30.7	**28.1**	**2.03**	**21.2**
80	3.0	2.3	5.2	23.0	16.8	1.95	29.6	28.2	2.04	21.3
	4.5	4.6	10.6	23.3	16.9	1.87	29.7	29.1	2.08	22.0
	6.0	7.6	17.5	23.7	17.1	1.78	29.8	29.9	2.12	22.7
90	3.0	2.2	5.9	21.6	16.6	2.15	28.9	27.7	2.03	20.8
	4.5	4.4	10.3	21.9	16.7	2.06	29.0	28.6	2.07	21.5
	6.0	7.3	16.9	22.3	16.8	1.97	29.0	29.4	2.11	22.2
100	3.0	2.1	4.9	20.4	16.4	2.33	28.4	Operation Not Recommended		
	4.5	4.3	9.9	20.7	16.5	2.24	28.3			
	6.0	7.1	16.3	21.0	16.6	2.14	28.3			
110	3.0	2.0	4.7	19.6	15.7	2.45	27.9			
	4.5	4.1	9.5	19.9	15.9	2.35	27.9			
	6.0	6.8	15.7	20.2	16.0	2.24	27.8			

LEGEND

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THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (**bold** printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 60 F EWT requires optional insulated water circuit.
6. Operation below 40 F EWT is based upon 15% antifreeze solution.
7. See Correction Factors tables for operating conditions other than those listed above.
8. Performance capacities shown in thousands of Btuh.

Performance data (cont)

50RHR,RVR030 UNIT PERFORMANCE
1000 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	7.5	4.5	10.3	Operation Not Recommended				17.2	1.69	11.5
30	3.8	1.3	3.0	39.6	28.7	1.46	44.6	18.9	1.77	12.8
	5.5	2.5	5.8	40.9	29.2	1.41	45.7	19.5	1.80	13.4
	7.5	4.3	10.0	42.2	29.8	1.36	46.9	20.2	1.83	14.0
40	3.8	1.3	2.9	34.6	25.5	1.59	40.1	21.9	1.90	15.5
	5.5	2.4	5.6	35.8	26.0	1.53	41.0	22.7	1.93	16.1
	7.5	4.2	9.7	37.0	26.5	1.48	42.0	23.5	1.96	16.8
50	3.8	1.2	2.8	31.5	23.6	1.75	37.4	25.2	2.03	18.3
	5.5	2.4	5.4	32.5	24.1	1.68	38.3	26.1	2.07	19.1
	7.5	4.1	9.4	33.6	24.5	1.62	39.1	27.0	2.10	19.8
60	3.8	1.2	2.7	29.6	22.5	1.92	36.1	28.6	2.16	21.2
	5.5	2.3	5.3	30.5	23.0	1.86	36.9	29.6	2.20	22.1
	7.5	3.8	9.1	31.5	23.4	1.79	37.6	30.6	2.23	23.0
70	3.8	1.1	2.7	28.4	22.0	2.11	35.6	31.9	2.28	24.1
	5.5	2.1	5.1	29.4	22.4	2.04	36.3	33.0	2.32	25.1
	7.5	**3.8**	**8.8**	30.3	22.9	1.97	37.0	**34.1**	**2.36**	**26.1**
80	3.8	1.1	2.6	27.6	21.7	2.31	35.5	35.0	2.39	26.9
	5.5	2.1	4.9	28.5	22.1	2.23	36.1	36.2	2.43	27.9
	7.5	3.7	8.5	29.5	22.5	2.15	36.8	37.5	2.47	29.0
90	3.8	1.1	2.5	26.6	21.2	2.50	35.1	37.9	2.48	29.4
	5.5	2.1	4.7	27.5	21.6	2.41	35.7	39.2	2.52	30.6
	7.5	3.6	8.2	28.4	22.0	2.32	36.3	40.5	2.56	31.8
100	3.8	1.0	2.4	24.8	20.4	2.69	34.0	Operation Not Recommended		
	5.5	2.0	4.6	25.7	20.8	2.60	34.5			
	7.5	3.4	7.9	26.5	21.2	2.50	35.0			
110	3.8	1.0	2.3	21.9	18.9	2.88	31.7			
	5.5	1.9	4.4	22.6	19.3	2.77	32.1			
	7.5	3.3	7.6	23.3	19.7	2.67	32.4			

LEGEND

ARI — Air Conditioning and Refrigeration Institute
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TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (**bold** printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 60 F EWT requires optional insulated water circuit.
6. Operation below 40 F EWT is based upon 15% antifreeze solution.
7. See Correction Factors tables for operating conditions other than those listed above.
8. Performance capacities shown in thousands of Btuh.

50RHR,RVR036 UNIT PERFORMANCE
1200 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	9.0	3.9	8.9	Operation Not Recommended				20.2	2.09	13.1
30	4.5	0.9	2.1	41.1	28.2	1.94	47.7	22.9	2.20	15.4
	6.8	2.1	4.9	41.8	28.4	1.89	48.3	23.6	2.24	16.0
	9.0	3.7	8.6	42.6	28.6	1.83	48.8	24.3	2.28	16.5
40	4.5	0.9	2.1	39.2	28.5	2.05	46.2	27.0	2.39	18.9
	6.8	2.1	4.8	39.9	28.7	1.99	46.6	27.9	2.44	19.6
	9.0	3.6	8.4	40.5	28.9	1.93	47.1	28.7	2.48	20.3
50	4.5	0.9	2.0	38.0	28.1	2.23	45.6	31.4	2.58	22.5
	6.8	2.0	4.6	38.7	28.3	2.16	46.1	32.4	2.64	23.4
	9.0	3.5	8.1	39.4	28.5	2.10	46.5	33.3	2.69	24.2
60	4.5	0.8	1.9	37.0	27.3	2.43	45.3	35.7	2.78	26.3
	6.8	1.9	4.5	37.7	27.5	2.36	45.7	36.9	2.84	27.2
	9.0	3.4	7.9	38.3	27.7	2.29	46.1	38.0	2.89	28.1
70	4.5	0.8	1.9	35.8	26.4	2.62	44.7	40.1	2.98	29.9
	6.8	1.9	4.3	36.4	26.6	2.54	45.1	41.4	3.04	31.0
	9.0	**3.3**	**7.6**	37.0	26.8	2.46	45.4	**42.6**	**3.10**	**32.1**
80	4.5	0.8	1.8	34.1	25.5	2.78	43.6	44.4	3.17	33.5
	6.8	1.8	4.2	34.7	25.7	2.70	43.9	45.8	3.23	34.7
	9.0	3.2	7.3	35.3	25.9	2.62	44.2	47.2	3.30	35.9
90	4.5	0.8	1.7	32.0	24.7	2.96	42.1	48.6	3.36	37.1
	6.8	1.7	4.0	32.6	24.9	2.87	42.4	50.1	3.43	38.4
	9.0	3.1	7.1	33.1	25.1	2.78	42.6	51.6	3.49	39.7
100	4.5	0.9	2.1	29.9	23.9	3.17	40.7	Operation Not Recommended		
	6.8	1.7	3.9	30.4	24.1	3.08	41.0			
	9.0	3.0	6.8	31.0	24.3	2.99	41.2			
110	4.5	0.7	1.6	28.3	23.1	3.51	40.3			
	6.8	1.6	3.7	28.8	23.3	3.40	40.5			
	9.0	2.8	6.6	29.3	23.4	3.30	40.6			

LEGEND

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THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (**bold** printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 60 F EWT requires optional insulated water circuit.
6. Operation below 40 F EWT is based upon 15% antifreeze solution.
7. See Correction Factors tables for operating conditions other than those listed above.
8. Performance capacities shown in thousands of Btuh.

Performance data (cont)

50RHR,RVR042 UNIT PERFORMANCE
1400 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	10.5	5.3	12.2	Operation Not Recommended				24.4	2.37	16.3
30	5.3	1.3	3.0	47.6	33.2	2.10	54.8	28.5	2.54	19.8
	7.9	2.9	6.6	48.1	33.4	2.03	55.0	29.2	2.57	20.5
	10.5	5.1	11.8	48.6	33.6	1.97	55.3	30.0	2.61	21.1
40	5.3	1.2	2.9	48.0	33.6	2.35	56.0	33.5	2.75	24.1
	7.9	2.8	6.4	48.5	33.8	2.27	56.2	34.4	2.79	24.8
	10.5	5.0	11.4	49.0	34.1	2.20	56.5	35.3	2.83	25.6
50	5.3	1.2	2.8	47.3	33.4	2.56	56.0	38.1	2.95	28.1
	7.9	2.7	6.2	47.8	33.7	2.48	56.3	39.1	2.99	28.9
	10.5	4.8	11.1	48.3	33.9	2.40	56.5	40.2	3.03	29.8
60	5.3	1.2	2.7	45.8	32.7	2.77	55.2	42.4	3.12	31.8
	7.9	2.6	6.0	46.2	33.0	2.69	55.4	43.6	3.16	32.8
	10.5	4.6	10.7	46.7	33.2	2.60	55.6	44.7	3.21	33.8
70	5.3	1.1	2.6	43.6	31.7	3.00	53.8	46.4	3.27	35.2
	7.9	2.5	5.6	44.0	31.9	2.91	54.0	47.6	3.32	36.3
	10.5	**4.5**	10.4	44.5	32.1	2.82	54.1	**48.9**	**3.36**	**37.4**
80	5.3	1.1	2.5	41.0	30.4	3.26	52.1	50.0	3.40	38.4
	7.9	2.4	5.6	41.4	30.6	3.16	52.2	51.4	3.45	39.6
	10.5	4.3	10.0	41.8	30.8	3.06	52.2	52.7	3.50	40.8
90	5.3	1.1	2.4	38.2	29.0	3.52	50.2	53.3	3.52	41.3
	7.9	2.4	5.4	38.5	29.2	3.42	50.2	54.8	3.57	42.6
	10.5	4.2	9.7	38.9	29.4	3.31	50.2	56.2	3.61	43.9
100	5.3	1.0	2.3	35.4	27.7	3.78	48.2	Operation Not Recommended		
	7.9	2.3	5.3	35.7	27.9	3.66	48.2			
	10.5	4.0	9.3	36.1	28.1	3.55	48.2			
110	5.3	1.0	2.3	32.8	26.8	3.98	46.4			
	7.9	2.2	5.1	33.2	27.0	3.86	46.3			
	10.5	3.9	9.0	33.5	27.2	3.73	46.2			

LEGEND

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TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (**bold** printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 60 F EWT requires optional insulated water circuit.
6. Operation below 40 F EWT is based upon 15% antifreeze solution.
7. See Correction Factors tables for operating conditions other than those listed above.
8. Performance capacities shown in thousands of Btuh.

50RHR,RVR048 UNIT PERFORMANCE
1600 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	12.0	7.6	17.6	Operation Not Recommended				29.6	2.96	19.5
30	6.0	2.5	5.8	51.6	35.5	2.49	60.1	33.5	3.01	23.2
	9.0	4.7	10.9	52.5	35.0	2.42	60.8	34.4	3.07	23.9
	12.0	7.4	17.1	53.4	34.6	2.35	61.4	35.2	3.14	24.5
40	6.0	2.4	5.6	55.4	38.6	2.76	64.8	38.7	3.23	27.7
	9.0	4.6	10.6	56.3	38.1	2.68	65.5	39.7	3.30	28.5
	12.0	7.2	16.6	57.3	37.6	2.60	66.1	40.7	3.37	29.2
50	6.0	2.3	5.4	55.0	39.3	3.01	65.2	44.4	3.48	32.6
	9.0	4.4	10.2	55.9	38.8	2.92	65.9	45.6	3.56	33.5
	12.0	7.0	16.1	56.8	38.2	2.83	66.5	46.8	3.63	34.4
60	6.0	2.3	5.2	52.6	38.5	3.27	63.8	50.9	3.75	38.1
	9.0	4.3	8.9	53.5	38.0	3.17	64.3	52.2	3.83	39.1
	12.0	6.7	15.6	54.4	37.5	3.08	64.9	53.6	3.91	40.2
70	6.0	2.3	5.2	49.8	37.2	3.53	61.9	57.6	4.03	43.9
	9.0	4.3	9.9	50.7	36.7	3.43	62.4	59.2	4.12	45.1
	12.0	**6.5**	**15.1**	51.5	36.2	3.32	62.9	**60.7**	**4.20**	**46.3**
80	6.0	2.1	4.9	47.4	35.8	3.81	60.4	63.8	4.31	49.1
	9.0	4.0	9.3	48.2	35.3	3.70	60.8	65.5	4.41	50.5
	12.0	6.3	14.6	49.0	34.8	3.59	61.3	67.2	4.50	51.8
90	6.0	2.0	4.7	45.5	34.5	4.10	59.4	68.0	4.60	52.3
	9.0	3.9	8.9	46.2	34.0	3.98	59.8	69.8	4.70	53.8
	12.0	6.1	14.0	47.0	33.5	3.86	60.2	71.6	4.80	55.2
100	6.0	2.0	4.5	43.3	33.1	4.39	58.3	Operation Not Recommended		
	9.0	3.7	8.6	44.1	32.6	4.26	58.6			
	12.0	5.9	13.5	44.8	32.2	4.13	58.9			
110	6.0	1.9	4.4	39.6	31.3	4.68	55.6			
	9.0	3.6	8.3	40.3	30.9	4.54	55.8			
	12.0	5.6	13.0	41.0	30.4	4.40	56.0			

LEGEND

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TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (**bold** printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 60 F EWT requires optional insulated water circuit.
6. Operation below 40 F EWT is based upon 15% antifreeze solution.
7. See Correction Factors tables for operating conditions other than those listed above.
8. Performance capacities shown in thousands of Btuh.

Performance data (cont)

50RHR,RVR060 UNIT PERFORMANCE
2000 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING CAPACITY				HEATING CAPACITY		
		PSI	ft wg	TC	TSC	kW	THR	TC	kW	THA
20	15.0	10.8	25.0	Operation Not Recommended				38.5	3.91	25.1
30	7.5	3.5	8.2	54.2	37.6	3.29	65.4	43.1	3.97	29.6
	11.3	6.7	15.6	54.3	37.7	3.18	65.2	43.8	4.01	30.1
	15.0	10.5	24.3	54.5	37.8	3.08	65.0	44.5	4.04	30.7
40	7.5	3.4	7.9	62.6	44.3	3.64	75.0	49.3	4.12	35.2
	11.3	6.5	15.1	62.7	44.5	3.52	74.7	50.1	4.15	35.9
	15.0	10.2	23.6	62.9	44.6	3.40	74.5	50.8	4.19	36.5
50	7.5	3.3	7.7	65.3	47.0	3.93	78.7	55.8	4.28	41.2
	11.3	6.3	14.6	65.5	47.2	3.80	78.4	56.7	4.32	41.9
	15.0	9.9	22.9	65.6	47.3	3.68	78.2	57.6	4.36	42.7
60	7.5	3.2	7.4	64.8	47.3	4.21	79.2	62.4	4.46	47.2
	11.3	6.1	14.2	65.0	47.5	4.07	78.9	63.4	4.50	48.1
	15.0	9.6	22.1	65.2	47.6	3.94	78.6	64.4	4.54	48.9
70	7.5	3.1	7.2	63.0	46.5	4.50	78.3	68.6	4.63	52.8
	11.3	5.9	13.7	63.1	46.7	4.36	78.0	69.6	4.67	53.7
	15.0	**9.3**	**21.4**	63.3	46.8	4.21	77.6	**70.7**	**4.72**	**54.6**
80	7.5	3.0	6.9	60.7	45.4	4.83	77.2	73.3	4.77	57.1
	11.3	5.7	13.2	60.9	45.5	4.67	76.8	74.5	4.81	58.1
	15.0	8.9	20.7	61.0	45.6	4.52	76.5	75.7	4.85	59.1
90	7.5	2.9	6.7	58.6	44.3	5.22	76.4	75.6	4.82	59.1
	11.3	5.5	12.8	58.7	44.4	5.05	76.0	76.8	4.87	60.2
	15.0	8.6	19.9	58.9	44.5	4.88	75.5	78.0	4.91	61.2
100	7.5	2.8	6.7	56.3	43.1	5.67	75.6	Operation Not Recommended		
	11.3	5.3	12.3	56.4	43.3	5.49	75.2			
	15.0	8.3	19.2	56.6	43.4	5.30	74.7			
110	7.5	2.7	6.2	52.9	41.4	6.21	74.1			
	11.3	5.1	11.8	53.0	41.5	6.00	73.5			
	15.0	8.0	18.5	53.2	41.7	5.80	73.0			

LEGEND

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TSC — Total Sensible Capacity (MBtuh)

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. ARI 320 points (**bold** printing) are shown for comparison purposes only. These are not certified data points.
4. All performance data is based upon the lower voltage of dual voltage rated units.
5. Operation below 60 F EWT requires optional insulated water circuit.
6. Operation below 40 F EWT is based upon 15% antifreeze solution.
7. See Correction Factors tables for operating conditions other than those listed above.
8. Performance capacities shown in thousands of Btuh.

CORRECTION FACTORS — NOMINAL CFM — 50RHR,RVR UNITS

AIRFLOW		HEATING			COOLING			
Cfm Per Nominal (ton)	% of Nominal	TC	kW	THA	TC	TSC	kW	THR
300	75%	0.957	1.061	0.922	0.962	0.873	0.962	0.961
325	81%	0.968	1.040	0.946	0.974	0.906	0.971	0.972
350	88%	0.979	1.020	0.970	0.985	0.938	0.980	0.983
375	94%	0.989	1.010	0.985	0.993	0.969	0.990	0.992
400	**100%**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
425	106%	1.011	0.997	1.015	1.007	1.034	1.010	1.008
450	113%	1.021	0.994	1.030	1.014	1.068	1.019	1.016

LEGEND

kW — Total Power Input (kilowatts)
TC — Total Capacity
THA — Total Heat of Absorption
THR — Total Heat of Rejection
TSC — Total Sensible Capacity

NOTE: Nominal airflow is 400 cfm.

CORRECTION FACTORS — ENTERING AIR — 50RHR,RVR UNITS

HEATING				COOLING										
EAT. DB (F)	TC	kW	THA	EAT WB (F)	TC	Sensible Capacity Entering Dry Bulb (F)							kW	THR
						70	75	80	80.6	85	90	95		
60	1.065	0.937	1.112	**60**	0.848	0.882	1.044	1.169	1.203	*	*	*	0.994	0.869
65	1.024	0.971	1.044	**65**	0.971	0.633	0.861	1.070	1.083	1.272	*	*	0.996	0.969
68	1.005	0.990	1.011	**66.2**	0.996	0.574	0.817	1.030	1.065	1.228	*	*	0.998	0.990
70	**1.000**	**1.000**	**1.000**	**67**	**1.000**	0.534	0.788	**1.000**	1.017	1.198	1.314	1.360	**1.000**	**1.000**
75	0.985	1.026	0.970	**70**	1.030	—	0.678	0.863	0.900	1.082	1.210	1.300	1.003	1.019
80	0.972	1.052	0.944	**75**	1.065	—	—	0.548	0.653	0.880	1.036	1.201	1.008	1.047

LEGEND

ARI — Air Conditioning and Refrigeration Institute
db — Dry Bulb
EAT — Entering-Air Temperature (F)
kW — Total Power Input (kilowatts)
TC — Total Capacity
THA — Total Heat of Absorption
THR — Total Heat of Rejection
TSC — Total Sensible Capacity
wb — Wet Bulb

*Sensible capacity equals total capacity.

NOTES:
1. ARI/ISO/ASHRAE 13256-1 uses entering air conditions of Cooling — 80.6 F db/66.2 F wb and Heating — 68 F db/59 F wb.
2. Discontinued Standards ARI 320, 325, and 330 used entering air conditions of Cooling 80 F db/67 F wb and Heating — 70 F db (**bold** print for comparison only).

Performance data (cont)

50RHR,RVR BLOWER PERFORMANCE

50RHR,RVR UNIT	RATED CFM	MIN CFM	FAN SPEED	AIRFLOW (Cfm) External Static Pressure (in. wg)														
				0.00	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.60	0.70	0.80	0.90
006*	200	150	HI	300	290	280	270	260	250	225	230	210	185	160				
			MED	240	230	220	210	200	190	180	160							
			LO	220	210	200	195	190	175	160								
009	300	225	HI	450	440	430	415	400	385	370	345	320	310	300	230			
			MED	410	400	390	375	360	350	340	325	310	290	270				
			LO	370	360	350	335	320	315	310	295	280	260	240				
012	375	300	HI	470	460	450	440	430	415	400	390	380	365	350	330			
			MED	410	395	380	370	360	355	350	340	330	320	310				
			LO	340	330	320	315	310	305	300								
015	500	375	HI	750	730	710	695	680	655	630	600	570	535	500	400			
			MED	660	640	620	605	590	570	550	525	500	470	440				
			LO	580	570	550	540	520	500	480	460	430	400	370				
019	600	450	HI	850	820	790	765	740	705	670	635	600	560	520	450			
			MED	700	680	660	640	620	590	560	530	500	470					
			LO	600	580	560	535	510	485	460								
024	800	600	HI						825	790	755	720	680	640	540			
			MED	850	825	800	770	740	715	690	655	620						
			LO	700	680	660	645	630	610									
030	1000	750	HI	1330	1295	1260	1225	1190	1145	1100	1050	1000	960	920	830			
			MED	1210	1185	1160	1130	1100	1050	1000	965	930	880	830				
			LO	1050	1030	1010	980	950	920	890	850	810	770					
036	1200	900	HI								1325	1280	1240	1200	1090	940		
			MED			1340	1310	1280	1250	1220	1185	1150	1100	1050	920			
			LO	1100	1080	1060	1035	1010	980	950	920							
042	1400	1050	HI	1790	1760	1730	1695	1660	1625	1590	1550	1510	1475	1440	1370	1270	1120	
			MED	1500	1485	1470	1445	1420	1400	1380	1350	1320	1295	1270	1180	1070		
			LO	1110	1100	1090	1075	1060	1050									
048	1600	1200	HI			1840	1795	1750	1725	1700	1650	1600	1540	1480	1380	1300		
			MED	1830	1785	1740	1700	1660	1615	1570	1535	1500	1450	1400	1320	1210		
			LO	1700	1670	1640	1600	1560	1525	1490	1460	1430	1385	1340	1250			
High Static 048	1600	1200	HI									1800	1750	1690	1580	1440	1270	
			MED						1870	1820	1740	1650	1640	1620	1530	1320	1220	
			LO					1840	1810	1770	1710	1650	1620	1580	1460	1340		
060	2000	1500	HI	2230	2215	2200	2160	2120	2090	2060	2035	2010	1985	1960	1880	1790	1660	
			MED	2040	2015	1990	1965	1940	1915	1890	1860	1830	1805	1780	1710	1620		
			LO	1840	1825	1810	1795	1780	1755	1730	1700	1670	1635	1600	1510			

LEGEND

— Shaded areas are below minimum CFM. This data is provided for troubleshooting information only.

CFM — Cubic Feet Per Minute

*Size 006 available in 50RHR units only.

NOTES:

1. Units factory shipped on medium speed. Other speeds require field selection.
2. All airflow is rated on 208 v operating with wet coil and clean air filter.
3. All units ARI (Air Conditioning and Refrigeration Institute)/ISO/ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) 13256-1 rated on high fan speed.
4. 575-v units, equipped with two-speed (H and M) fan.

50RHR,RVR UNITS
RADIATED SOUND POWER DATA

UNIT 50RHR,RVR	MODE	SPEED	DUCTED DISCHARGE							FREE AIR INLET COMBINED WITH RADIATED CABINET						
			Octave Band Frequency, Hz							Octave Band Frequency, Hz						
			125	250	500	1000	2000	4000	8000	125	250	500	1000	2000	4000	8000
006	FAN ONLY	LOW	62.5	59.0	57.0	58.5	54.5	52.0	49.5	60.5	58.0	52.8	47.0	42.0	35.5	37.0
		HIGH	63.0	62.0	59.0	61.0	57.5	54.5	42.5	60.0	59.5	55.0	49.5	44.5	39.5	38.0
	COOLING	LOW	62.5	60.0	58.0	59.5	55.5	53.0	49.5	61.0	57.5	53.0	47.5	43.0	37.5	36.0
		HIGH	62.8	61.5	59.0	60.8	57.0	54.3	46.0	60.7	58.4	54.3	49.0	44.5	39.9	36.6
	HEATING	LOW	65.5	62.5	59.2	60.7	56.2	53.7	50.5	64.0	60.0	54.3	48.7	43.7	38.2	37.0
		HIGH	65.8	64.0	60.2	62.0	57.7	55.0	47.0	63.7	60.9	55.6	50.2	45.2	40.6	37.6
009	FAN ONLY	LOW	63.0	59.5	57.5	59.0	55.0	52.5	50.0	61.5	58.5	53.5	47.5	42.5	37.0	38.0
		HIGH	63.5	62.5	59.5	62.0	58.0	55.5	54.0	61.5	60.5	56.0	50.0	45.0	40.5	39.0
	COOLING	LOW	63.0	61.0	59.0	60.0	56.5	53.5	50.5	62.5	59.0	54.5	49.0	43.0	38.0	38.0
		HIGH	63.3	62.5	60.0	61.5	58.0	55.0	52.5	62.5	60.0	55.8	50.3	44.3	39.8	38.5
	HEATING	LOW	66.0	63.5	60.2	61.2	57.2	54.2	51.5	65.5	61.5	56.0	50.2	43.7	38.7	39.0
		HIGH	66.3	65.0	61.2	62.7	58.7	55.7	53.5	65.5	62.5	57.3	51.5	45.0	40.5	39.5
012	FAN ONLY	LOW	63.5	60.5	58.5	60.0	56.0	53.0	51.5	62.5	59.5	54.0	48.5	44.0	38.0	39.0
		HIGH	66.5	63.5	60.5	62.5	58.0	57.0	61.5	63.0	62.0	56.0	51.0	46.5	42.0	40.0
	COOLING	LOW	64.0	62.0	60.0	60.5	57.0	54.0	51.0	64.0	58.0	54.8	49.5	45.0	39.0	39.2
		HIGH	65.5	63.5	61.0	61.8	58.0	56.0	56.0	64.3	59.3	55.8	50.8	46.3	41.0	39.7
	HEATING	LOW	67.0	64.5	61.2	61.7	57.7	54.7	52.0	67.0	60.5	56.0	50.7	45.7	39.7	40.2
		HIGH	68.5	66.0	62.2	63.0	58.7	56.7	57.0	67.3	61.8	57.0	52.0	47.0	41.7	40.7
015	FAN ONLY	LOW	72.5	58.0	59.5	57.5	54.0	52.0	44.5	63.0	55.5	52.5	48.5	45.5	39.0	31.0
		HIGH	65.5	62.0	57.5	63.0	58.5	48.0	38.0	66.0	60.2	55.0	51.5	48.0	43.0	34.3
	COOLING	LOW	72.0	59.5	60.5	58.0	55.0	53.0	45.0	64.5	59.0	57.0	50.5	47.0	40.5	37.0
		HIGH	69.2	61.1	59.7	60.2	56.8	51.4	42.4	65.7	60.9	58.0	51.7	48.0	42.1	38.3
	HEATING	LOW	75.0	62.0	62.3	59.2	55.7	53.7	46.0	67.5	61.5	58.5	51.7	47.7	41.2	38.0
		HIGH	72.2	63.6	61.5	61.4	57.5	52.1	43.4	68.7	63.4	59.5	52.9	48.7	42.8	39.3
019	FAN ONLY	LOW	73.0	58.5	60.5	58.0	55.0	53.0	45.0	64.0	56.5	53.5	49.5	46.5	39.5	31.5
		HIGH	67.0	63.0	64.0	64.0	60.0	58.5	52.0	68.5	61.5	56.0	53.0	49.5	44.5	35.0
	COOLING	LOW	73.0	60.0	61.5	59.0	56.0	53.5	46.0	65.5	59.5	54.0	51.0	48.5	41.5	38.0
		HIGH	70.6	61.8	62.9	61.4	58.0	55.7	48.8	67.3	61.5	55.0	52.4	49.7	43.5	39.4
	HEATING	LOW	76.0	62.5	63.6	60.2	56.7	54.2	47.0	68.5	62.0	55.5	52.2	49.2	42.2	39.0
		HIGH	73.6	64.3	65.0	62.6	58.7	56.4	49.8	70.3	64.0	56.5	53.6	50.4	44.2	40.4
024	FAN ONLY	LOW	74.0	59.5	62.0	59.0	56.0	54.0	46.0	65.0	58.0	54.5	51.0	48.0	41.0	32.5
		HIGH	68.5	64.5	61.0	65.5	61.5	60.0	53.5	70.0	63.5	57.5	55.0	51.5	46.5	36.5
	COOLING	LOW	73.5	61.0	62.5	60.0	57.0	55.0	46.5	68.5	60.8	55.5	53.0	49.5	43.0	39.9
		HIGH	71.3	63.0	62.1	62.6	59.2	57.4	49.5	70.5	63.0	56.7	54.6	50.9	45.2	41.5
	HEATING	LOW	76.5	63.5	61.9	61.2	57.7	55.7	47.5	71.5	63.3	57.3	54.2	50.2	43.7	40.9
		HIGH	74.3	65.5	61.5	63.8	59.9	58.1	50.5	73.5	65.5	58.5	55.8	51.6	45.9	42.5
030	FAN ONLY	LOW	76.5	64.5	68.0	63.5	62.0	62.0	56.5	69.5	61.5	57.5	55.5	53.0	49.5	40.0
		HIGH	72.0	67.5	69.0	69.0	65.5	65.0	60.5	74.5	64.5	59.0	58.5	56.0	54.0	46.0
	COOLING	LOW	81.5	65.0	68.0	64.5	62.5	62.5	57.0	71.5	62.5	57.5	55.5	53.5	49.0	41.0
		HIGH	80.2	65.9	68.3	66.2	63.6	63.4	58.2	73.0	65.2	58.9	58.2	56.2	53.1	46.4
	HEATING	LOW	84.0	66.5	69.0	65.0	62.5	62.0	57.5	74.0	64.0	58.5	56.0	53.5	48.5	41.5
		HIGH	82.7	67.4	69.3	66.7	63.6	62.9	58.7	75.5	66.7	59.9	58.7	56.2	52.6	46.9
036	FAN ONLY	LOW	73.5	65.0	66.5	63.5	61.5	61.0	54.5	69.0	61.0	57.5	55.0	52.5	47.0	39.0
		HIGH	73.0	69.5	69.5	70.5	66.5	66.0	61.5	73.5	67.5	61.5	60.0	56.0	54.0	46.0
	COOLING	LOW	79.5	65.0	67.5	63.0	61.5	60.0	54.5	74.0	64.0	61.0	55.0	51.5	47.0	42.5
		HIGH	79.4	66.4	68.4	65.1	63.0	61.5	56.6	75.4	66.0	62.2	56.5	52.6	49.1	44.6
	HEATING	LOW	82.0	66.5	68.5	63.5	61.5	59.5	55.0	76.5	65.5	62.0	55.5	51.5	46.5	43.0
		HIGH	81.9	67.9	69.4	65.6	63.0	61.0	57.1	77.9	67.5	63.2	57.0	52.6	48.6	45.1
042	FAN ONLY	LOW	64.0	59.0	58.5	56.0	52.0	48.5	40.5	63.0	58.0	55.5	52.0	44.0	37.0	31.0
		HIGH	72.0	72.0	68.5	69.0	65.0	64.5	59.0	74.5	69.0	63.5	62.0	56.5	53.0	46.0
	COOLING	LOW	71.0	62.5	60.5	58.5	55.0	51.0	44.0	80.0	65.5	58.0	54.5	47.5	41.5	41.0
		HIGH	72.6	65.1	62.5	61.1	57.6	54.2	47.7	82.3	69.9	61.2	58.5	52.5	47.9	47.0
	HEATING	LOW	73.5	64.0	61.5	59.0	55.0	50.5	44.5	82.5	67.0	59.0	55.0	47.5	41.0	41.5
		HIGH	75.1	66.6	63.5	61.6	57.6	53.7	48.2	84.8	69.2	60.6	57.0	50.0	44.2	44.5
048	FAN ONLY	LOW	65.0	60.0	59.5	56.5	53.0	49.0	41.5	64.0	59.0	57.0	53.0	45.0	38.0	32.0
		HIGH	73.5	73.0	70.0	70.5	66.5	65.5	60.0	76.0	70.5	65.0	63.5	58.0	55.0	47.5
	COOLING	LOW	72.5	63.0	61.0	59.5	56.0	52.0	45.0	81.0	66.3	59.0	55.3	49.5	44.0	42.5
		HIGH	74.2	65.6	63.1	62.3	58.7	55.3	48.7	83.4	68.6	60.6	57.4	52.1	47.4	45.6
	HEATING	LOW	75.0	64.5	62.0	60.0	56.0	51.5	45.5	83.5	67.8	60.0	55.8	49.5	43.5	43.0
		HIGH	76.7	67.1	64.1	62.8	58.7	54.8	49.2	85.9	70.1	61.6	57.9	52.1	46.9	46.1
060	FAN ONLY	LOW	78.5	74.0	71.5	71.5	69.0	68.5	65.0	79.5	71.0	65.0	62.5	60.0	56.5	49.0
		HIGH	81.0	77.5	74.5	74.5	72.0	72.0	68.5	82.0	74.5	67.5	65.0	63.0	60.0	53.0
	COOLING	LOW	78.5	74.0	71.0	71.0	68.5	68.0	64.5	79.0	71.0	65.0	63.0	59.5	56.5	49.0
		HIGH	79.0	74.7	71.6	71.6	69.1	68.7	65.2	79.5	71.7	65.5	63.5	60.1	57.2	49.8
	HEATING	LOW	81.0	75.5	72.0	71.5	68.5	67.5	65.0	81.5	72.5	66.0	63.5	59.5	56.0	49.5
		HIGH	81.5	76.2	72.6	72.1	69.1	68.2	65.7	82.0	73.2	66.5	64.0	60.1	56.7	50.3

NOTES:
1. All sound power level performance is expressed in dB with reference to 1 picoWatt.
2. Data based on sound measurements made in a reverberant room on representative units from each cabinet size in accordance with ARI (Air Conditioning and Refrigeration Institute) Standard 260-2000.
3. Ratings for medium speed can be obtained through interpolation.
4. Size 006 available in 50RHR unit only.

Performance data (cont)

50RHR,RVR UNITS WITH MUTE PACKAGE OPTION
RADIATED SOUND POWER DATA

UNIT 50RHR,RVR	MODE	SPEED	FREE AIR INLET COMBINED WITH RADIATED CABINET						
			Octave Band Frequency, Hz						
			125	250	500	1000	2000	4000	8000
006	FAN ONLY	LOW	60.0	58.5	51.3	45.5	39.0	33.0	37.0
		HIGH	59.5	57.5	52.5	45.5	40.0	34.5	35.0
	COOLING	LOW	59.5	54.5	51.5	45.0	40.0	33.5	31.0
		HIGH	58.7	55.9	53.3	46.0	41.0	36.4	32.1
	HEATING	LOW	62.5	57.0	52.8	46.2	40.7	34.2	32.0
		HIGH	61.7	58.4	54.6	47.2	41.7	37.1	36.6
009	FAN ONLY	LOW	61.0	59.0	52.0	46.0	39.5	34.5	38.0
		HIGH	61.0	58.5	53.5	46.0	40.5	35.5	36.0
	COOLING	LOW	61.0	56.0	53.0	46.5	40.0	34.0	33.0
		HIGH	60.5	57.5	54.8	47.3	40.8	36.3	34.0
	HEATING	LOW	64.0	58.5	54.5	47.7	40.7	34.7	34.0
		HIGH	63.5	60.0	56.3	48.5	41.5	37.0	38.5
012	FAN ONLY	LOW	62.0	60.0	52.5	47.0	41.0	35.5	39.0
		HIGH	62.5	60.0	53.5	47.0	42.0	37.0	37.0
	COOLING	LOW	62.5	55.0	53.3	47.0	42.0	35.0	34.2
		HIGH	62.3	56.8	54.8	47.8	42.8	37.5	35.2
	HEATING	LOW	65.5	57.5	54.5	48.2	42.7	35.7	35.2
		HIGH	65.3	59.3	56.0	49.0	43.5	38.2	39.7
015	FAN ONLY	LOW	62.5	56.0	51.0	47.0	42.5	36.5	31.0
		HIGH	65.5	58.2	52.5	47.5	43.5	38.0	31.3
	COOLING	LOW	63.0	56.0	55.5	48.0	44.0	36.5	32.0
		HIGH	63.7	58.4	57.0	48.7	44.5	38.6	33.8
	HEATING	LOW	66.0	58.5	57.0	49.2	44.7	37.2	33.0
		HIGH	66.7	60.9	58.5	49.9	45.2	39.3	38.3
019	FAN ONLY	LOW	63.5	57.0	52.0	48.0	43.5	37.0	31.5
		HIGH	68.0	59.5	53.5	49.0	45.0	39.5	32.0
	COOLING	LOW	64.0	56.5	52.5	48.5	45.5	37.5	33.0
		HIGH	65.3	59.0	54.0	49.4	46.2	40.0	34.9
	HEATING	LOW	67.0	59.0	54.0	49.7	46.2	38.2	34.0
		HIGH	68.3	61.5	55.5	50.6	46.9	40.7	39.4
024	FAN ONLY	LOW	64.5	58.5	53.0	49.5	45.0	38.5	32.5
		HIGH	69.5	61.5	55.0	51.0	47.0	41.5	33.5
	COOLING	LOW	67.0	57.8	54.0	50.5	46.5	39.0	34.9
		HIGH	68.5	60.5	55.7	51.6	47.4	41.7	37.0
	HEATING	LOW	70.0	60.3	55.8	51.7	47.2	39.7	35.9
		HIGH	71.5	63.0	57.5	52.8	48.1	42.4	41.5

NOTES:
1. All sound power level performance is expressed in dB with reference to 1 picoWatt.
2. Data based on sound measurements made in a reverberant room on representative units from each cabinet size in accordance with ARI (Air Conditioning and Refrigeration Institute) Standard 260-2000.
3. Ratings for medium speed can be obtained through interpolation.
4. Size 006 available in 50RHR unit only.

50RHR,RVR UNITS WITH MUTE PACKAGE OPTION (cont)

RADIATED SOUND POWER DATA (cont)

UNIT 50RHR,RVR	MODE	SPEED	FREE AIR INLET COMBINED WITH RADIATED CABINET						
			Octave Band Frequency, Hz						
			125	250	500	1000	2000	4000	8000
030	FAN ONLY	LOW	69.0	62.0	56.0	54.0	50.0	47.0	40.0
		HIGH	74.0	62.5	56.5	54.5	51.5	49.0	43.0
	COOLING	LOW	70.0	59.5	56.0	53.0	50.5	45.0	36.0
		HIGH	71.0	62.7	57.9	55.2	52.7	49.6	41.9
	HEATING	LOW	72.5	61.0	57.0	53.5	50.5	44.5	36.5
		HIGH	73.5	64.2	58.9	55.7	52.7	49.1	45.9
036	FAN ONLY	LOW	68.5	61.5	56.0	53.5	49.5	44.5	39.0
		HIGH	73.0	65.5	59.0	56.0	51.5	49.0	43.0
	COOLING	LOW	72.5	61.0	59.5	52.5	48.5	43.0	37.5
		HIGH	73.4	63.5	61.2	53.5	49.1	45.6	40.1
	HEATING	LOW	75.0	62.5	60.5	53.0	48.5	42.5	38.0
		HIGH	75.9	65.0	62.2	54.0	49.1	45.1	44.1
042	FAN ONLY	LOW	62.5	58.5	54.0	50.5	41.0	34.5	31.0
		HIGH	74.0	67.0	61.0	58.0	52.0	48.0	43.0
	COOLING	LOW	78.5	62.5	56.5	52.0	44.5	37.5	36.0
		HIGH	80.3	67.4	60.2	55.5	49.0	44.4	42.5
	HEATING	LOW	81.0	64.0	57.5	52.5	44.5	37.0	36.5
		HIGH	82.8	66.7	59.6	54.0	46.5	40.7	43.5
048	FAN ONLY	LOW	63.5	59.5	55.5	51.5	42.0	35.5	32.0
		HIGH	75.5	68.5	62.5	59.5	53.5	50.0	44.5
	COOLING	LOW	79.5	63.3	57.5	52.8	46.5	40.0	37.5
		HIGH	81.4	66.1	59.6	54.4	48.6	43.9	41.1
	HEATING	LOW	82.0	64.8	58.5	53.3	46.5	39.5	38.0
		HIGH	83.9	67.6	60.6	54.9	48.6	43.4	45.1
060	FAN ONLY	LOW	79.0	71.5	63.5	61.0	57.0	54.0	49.0
		HIGH	81.5	72.5	65.0	61.0	58.5	55.0	50.0
	COOLING	LOW	77.5	68.0	63.5	60.5	56.5	52.5	44.0
		HIGH	77.5	69.2	64.5	60.5	56.6	53.7	45.3
	HEATING	LOW	80.0	69.5	64.5	61.0	56.5	52.0	44.5
		HIGH	80.0	70.7	65.5	61.0	56.6	53.2	49.3

NOTES:
1. All sound power level performance is expressed in dB with reference to 1 picoWatt.
2. Data based on sound measurements made in a reverberant room on representative units from each cabinet size in accordance with ARI (Air Conditioning and Refrigeration Institute) Standard 260-2000.
3. Ratings for medium speed can be obtained through interpolation.
4. Size 006 available in 50RHR unit only.

Electrical data

50RHR,RVR ELECTRICAL DATA

50RHR,RVR UNIT	VOLTS-PHASE 60 Hz	VOLTAGE MIN/MAX	COMPRESSOR		FAN MOTOR FLA	TOTAL UNIT FLA	MIN CIRCUIT AMP	MAX FUSE/HACR
			RLA	LRA				
006*	208/230-1	197/254	2.9	17.7	0.40	3.3	4.0	15
	265-1	239/292	2.5	15.0	0.40	2.9	3.5	15
009	208/230-1	197/254	3.9	22.2	0.80	4.7	5.7	15
	265-1	239/292	3.3	18.8	0.70	4.0	4.8	15
012	208/230-1	197/254	5.3	27.9	0.80	6.1	7.4	15
	265-1	239/292	4.2	22.2	0.70	4.9	6.0	15
015	208/230-1	197/254	5.9	29.0	1.00	6.9	8.4	15
	265-1	239/292	5.4	27.0	0.90	6.3	7.6	15
019	208/230-1	197/254	8.6	49.0	1.10	9.7	11.9	20
	265-1	239/292	8.1	44.0	0.90	9.0	11.0	15
024	208/230-1	197/254	9.6	50.0	1.30	10.9	13.3	20
	265-1	239/292	8.8	55.0	1.60	10.4	12.6	20
	208/230-3	197/254	6.7	51.0	1.30	8.0	9.7	15
	460-3	414/506	3.5	25.0	0.90	4.4	5.3	15
030	208/230-1	197/254	11.2	61.0	1.90	13.1	15.9	25
	265-1	239/292	9.8	58.0	1.70	11.5	14.0	20
	208/230-3	197/254	6.9	55.0	1.90	8.8	10.5	15
	460-3	414/506	3.6	28.0	1.00	4.6	5.5	15
036	208/230-1	197/254	14.4	82.0	3.00	17.4	21.0	35
	265-1	239/292	12.2	64.0	2.70	14.9	18.0	30
	208/230-3	197/254	9.4	65.5	3.00	12.4	14.8	20
	460-3	414/506	4.4	33.0	1.70	6.1	7.2	15
042	208/230-1	197/254	16.2	96.0	3.00	19.2	23.3	35
	208/230-3	197/254	10.3	75.0	3.00	13.3	15.9	25
	460-3	414/506	4.3	40.0	1.70	6.0	7.1	15
	575-3	518/633	3.7	31.0	1.50	5.2	6.0	15
048	208/230-1	197/254	18.3	102.0	3.40	21.7	26.3	40
	208/230-3	197/254	12.6	91.0	3.40	16.0	19.2	30
	460-3	414/506	5.7	42.0	1.80	7.5	8.9	15
	575-3	518/633	4.7	39.0	1.40	6.1	7.3	15
060	208/230-1	197/254	25.6	170.0	4.90	30.5	36.9	60
	208/230-3	197/254	14.7	124.0	4.90	19.6	23.3	35
	460-3	414/506	7.4	59.6	2.50	9.9	11.8	15
	575-3	518/633	5.9	49.4	1.90	7.8	9.3	15

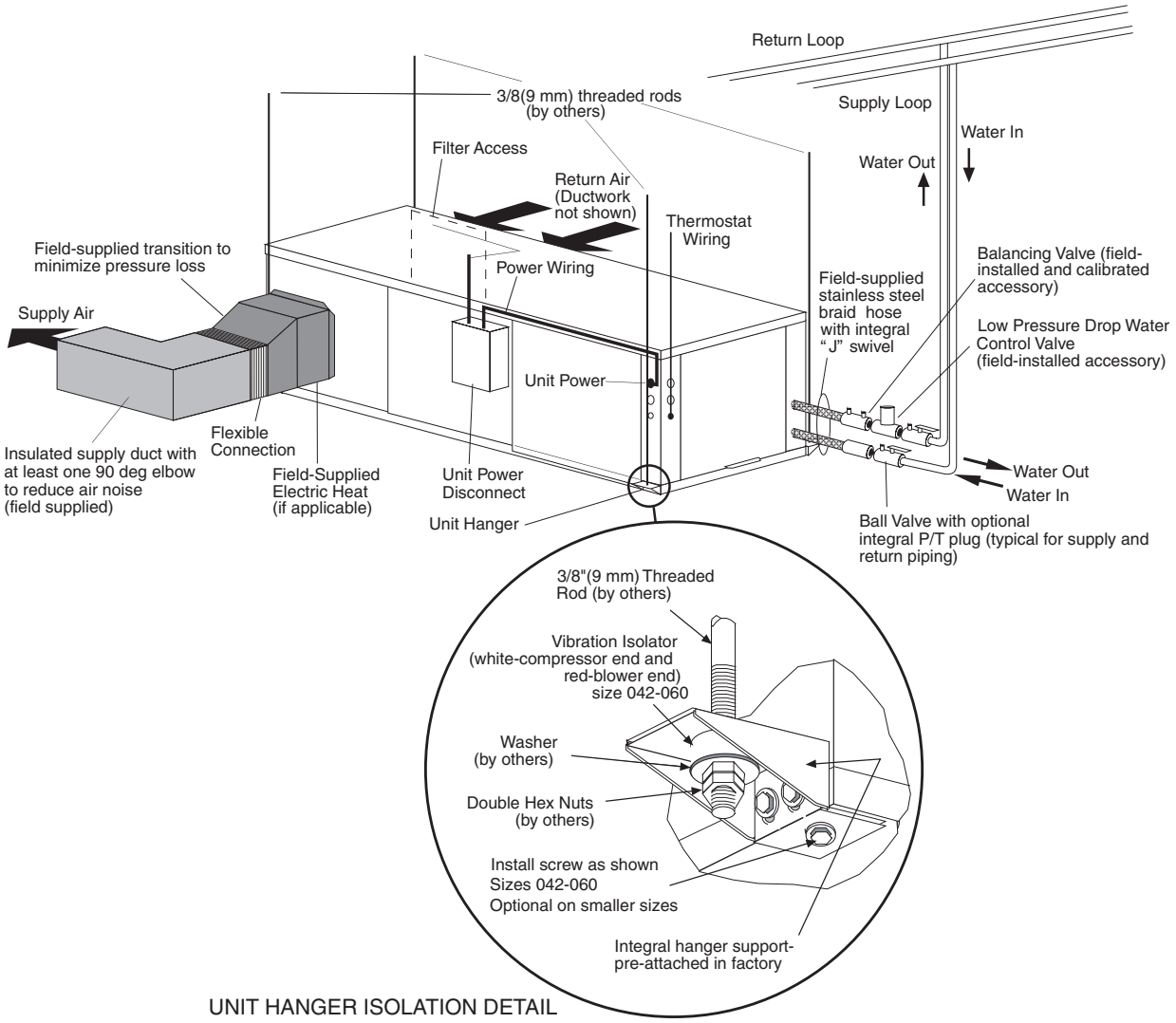
LEGEND

FLA — Full Load Amps
HACR — Heating, Air Conditioning and Refrigeration
LRA — Locked Rotor Amps
RLA — Rated Load Amps

*Size 006 is available in 50RHR units only.

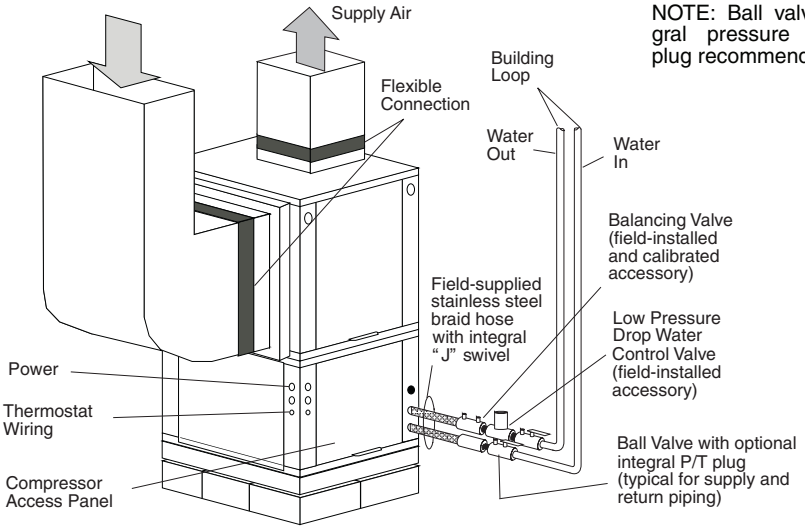
Typical piping and wiring

TYPICAL INSTALLATION — 50RHR UNITS


Return Loop
3/8(9 mm) threaded rods (by others)
Supply Loop
Water In
Water Out
Filter Access
Return Air (Ductwork not shown)
Thermostat Wiring
Power Wiring
Field-supplied transition to minimize pressure loss
Supply Air
Field-supplied stainless steel braid hose with integral "J" swivel
Balancing Valve (field-installed and calibrated accessory)
Low Pressure Drop Water Control Valve (field-installed accessory)
Unit Power
Insulated supply duct with at least one 90 deg elbow to reduce air noise (field supplied)
Flexible Connection
Field-Supplied Electric Heat (if applicable)
Unit Power Disconnect
Unit Hanger
Water Out
Water In
Ball Valve with optional integral P/T plug (typical for supply and return piping)
3/8"(9 mm) Threaded Rod (by others)
Vibration Isolator (white-compressor end and red-blower end) size 042-060
Washer (by others)
Double Hex Nuts (by others)
Install screw as shown Sizes 042-060 Optional on smaller sizes
Integral hanger support-pre-attached in factory

UNIT HANGER ISOLATION DETAIL

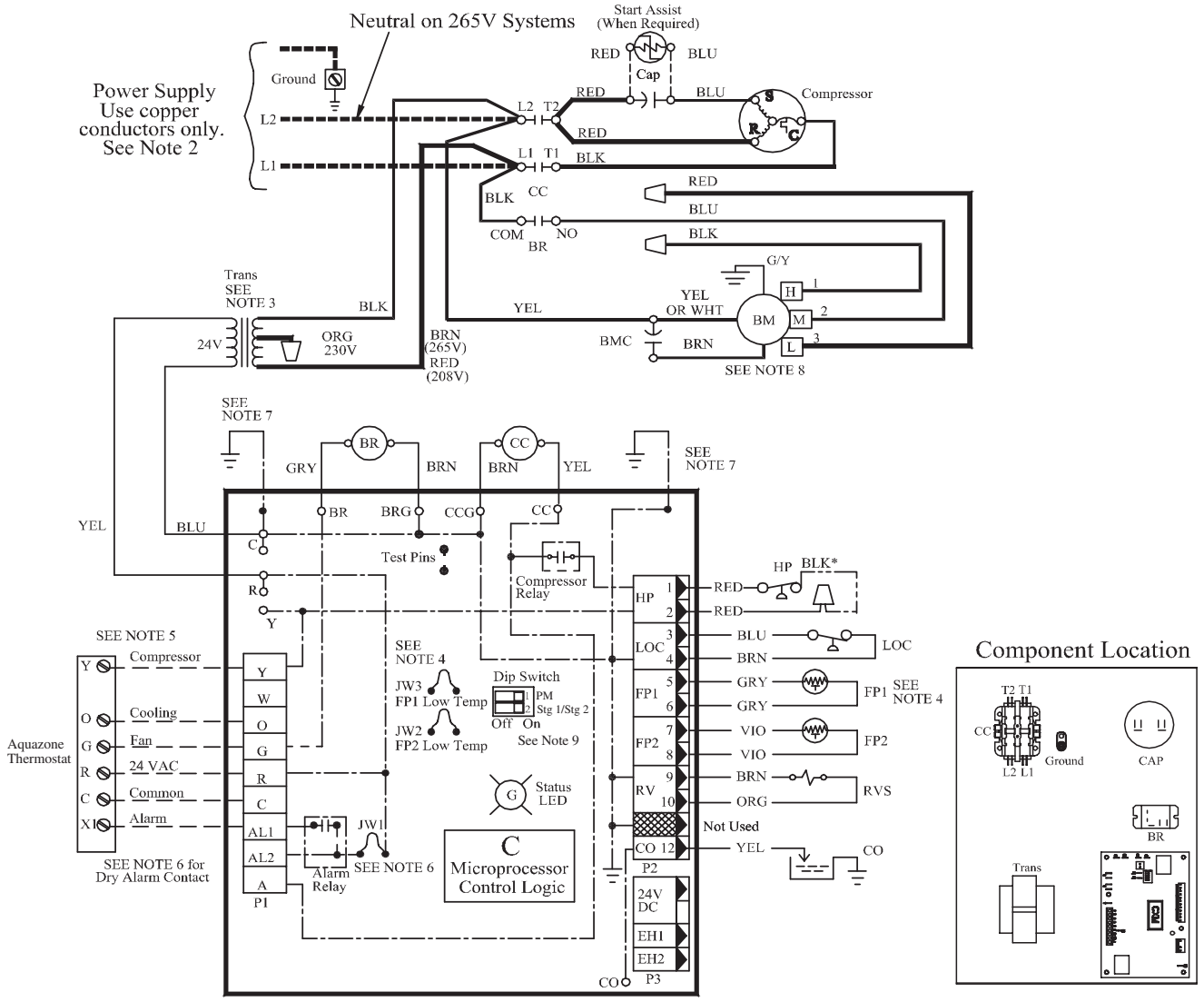
TYPICAL VERTICAL INSTALLATION — 50RVR UNITS


Supply Air
Building Loop
Flexible Connection
Water Out
Water In
Balancing Valve (field-installed and calibrated accessory)
Field-supplied stainless steel braid hose with integral "J" swivel
Low Pressure Drop Water Control Valve (field-installed accessory)
Power
Thermostat Wiring
Compressor Access Panel
Ball Valve with optional integral P/T plug (typical for supply and return piping)

NOTE: Ball valve with integral pressure temperature plug recommended.

Typical wiring schematics

TYPICAL AQUAZONE™ COMPLETE C CONTROL WIRING



LEGEND

AL — Alarm Relay Contacts
BM — Blower Motor
BMC — Blower Motor Capacitor
BR — Blower Relay
CAP — Capacitor
CC — Compressor Contactor
CO — Sensor, Condensate Overflow
FP1 — Sensor, Water Coil Freeze Protection
FP2 — Sensor, Air Coil Freeze Protection
HP — High-Pressure Switch
JW1 — Jumper, Alarm

*Optional wiring.

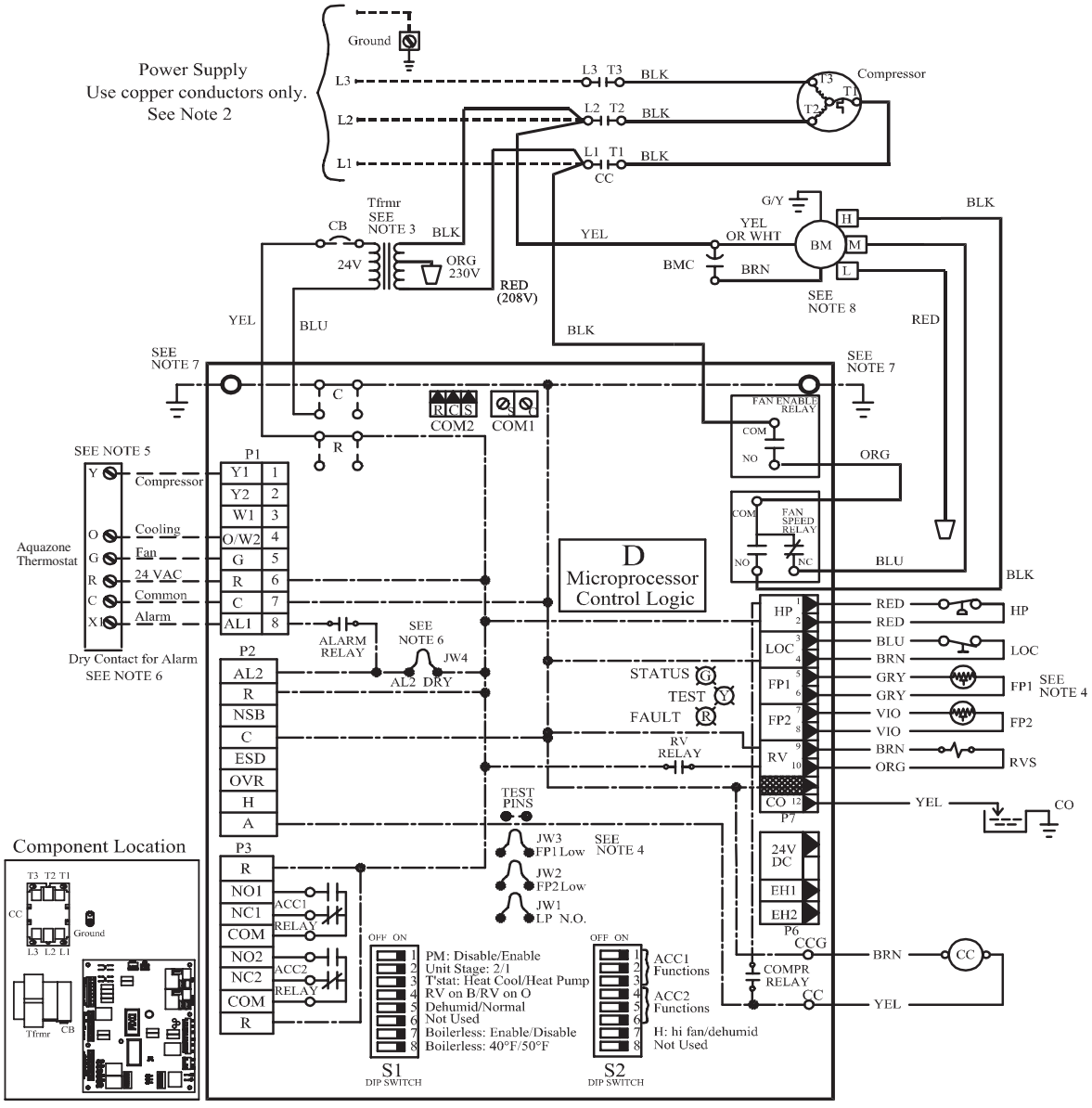
LOC — Loss of Charge Pressure Switch
NEC — National Electrical Code
P1 — Field Wiring Terminal Block
PM — Performance Monitor
RVS — Reversing Valve Solenoid
Trans — Transformer

Field Line Voltage Wiring
Field Low Voltage Wiring
Printed Circuit Trace
Optional Wiring

Relay/Contactor Coil
Condensate Pan
Solenoid Coil
Temperature Switch
Thermistor
Ground
Wire Nut

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with National Electrical Code (NEC) and local codes.
3. Transformer is wired to 265-v (BRN) lead for 265-1-60 units, or 208-v (RED) lead for 208-1-60. For 230-1-60 switch RED and ORG leads at L1 and insulate RED lead. Transformer is energy limiting or may have circuit breaker.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical Aquazone thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. A 24-v alarm signal is shown. For dry alarm contact, cut JW1 jumper and dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via control board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. For high or low speed remove BLU wire from BR 'NO' and replace with BLK or RED wire respectively. Tape off unused terminal.
9. Both DIP switches need to be in the ON position.

TYPICAL AQUAZONE™ DELUXE D CONTROL WIRING



LEGEND

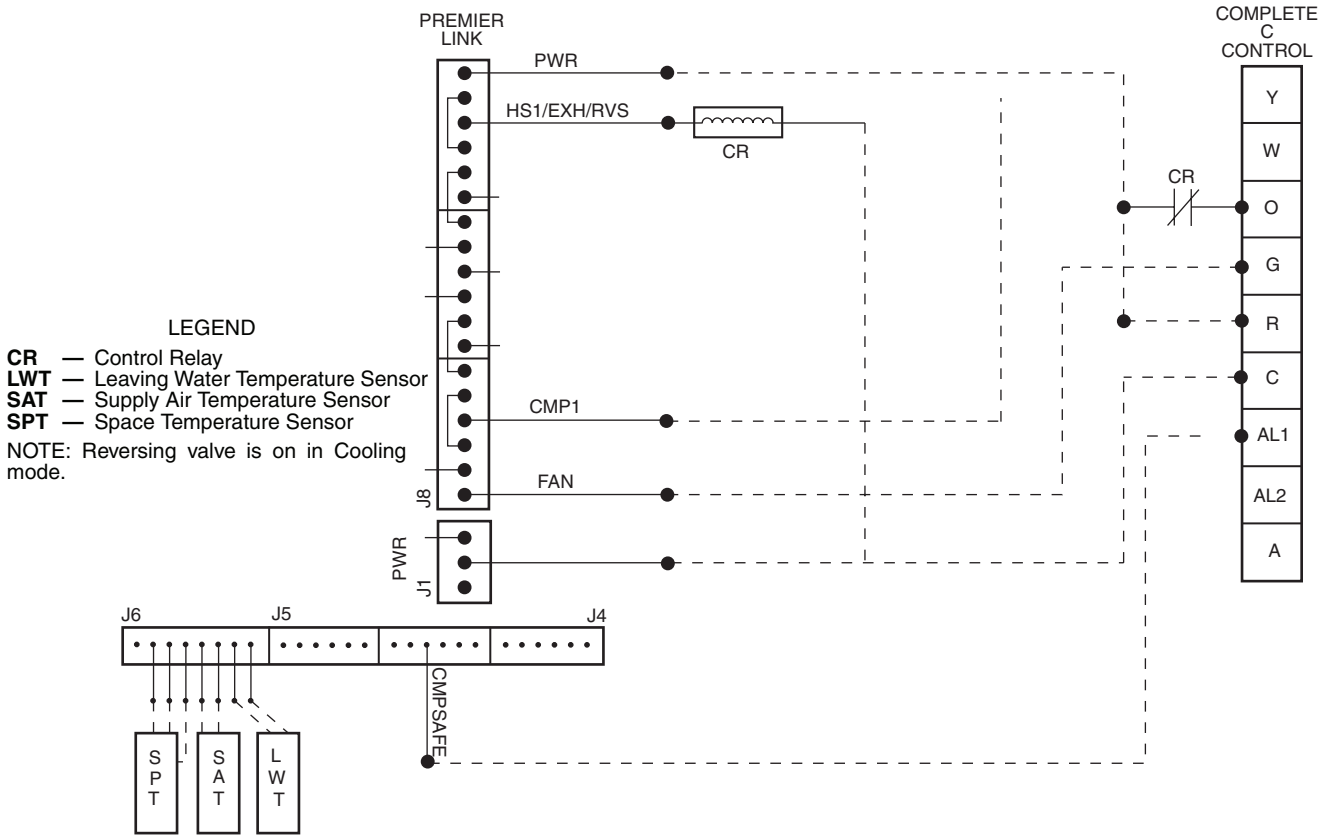
AL	— Alarm Relay Contacts	**LOC**	— Loss of Charge Pressure Switch
BM	— Blower Motor	**NEC**	— National Electrical Code
BMC	— Blower Motor Capacitor	**P1**	— Field Wiring Terminal Block
CB	— Circuit Breaker	**PM**	— Performance Monitor
CC	— Compressor Contactor	**RVS**	— Reversing Valve Solenoid
CO	— Sensor, Condensate Overflow	**Tfrmr**	— Transformer
FP1	— Sensor, Water Coil Freeze Protection		— Field Line Voltage Wiring
FP2	— Sensor, Air Coil Freeze Protection		— Field Low Voltage Wiring
HP	— High-Pressure Switch		— Printed Circuit Trace
JW1	— Jumper, Alarm		

Relay/Contactor Coil
Condensate Pan
Solenoid Coil
Thermistor
Ground
Wire Nut

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with National Electrical Code (NEC) and local codes.
3. Transformer is wired to 208-v (RED) lead for 208-3-60. For 230-3-60 switch RED and ORG leads at L1 and insulate RED lead.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical Aquazone thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. A 24-v alarm signal is shown. For dry alarm contact, cut AL2 dry jumper and dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via control board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. Blower motor is factory wired for medium and high speeds. For any other combination of speeds, attach the lower speed wire to fan speed relay N.O. wire.

Typical control wiring

PREMIERLINK™ CONTROLLER APPLICATIONS WITH COMPLETE C CONTROL

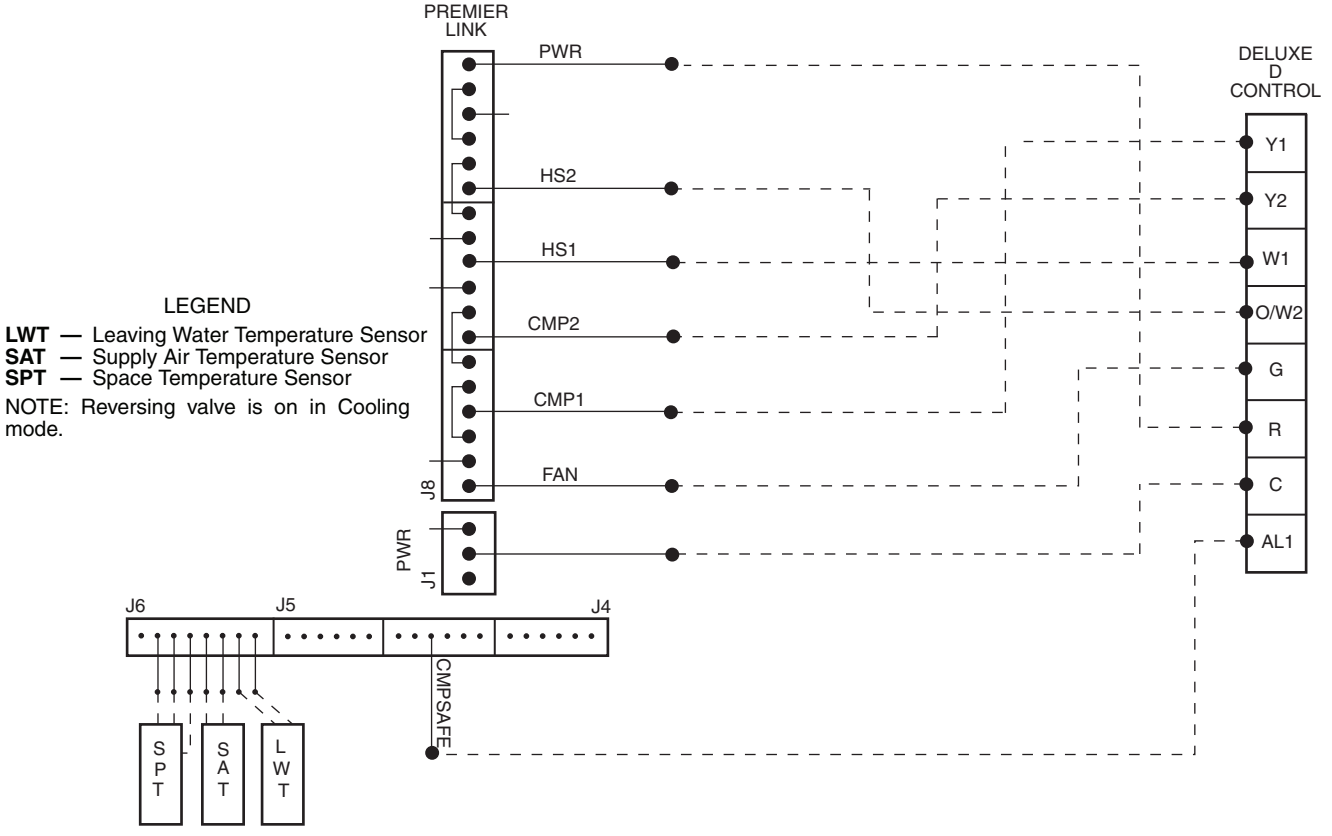


LEGEND

CR — Control Relay
LWT — Leaving Water Temperature Sensor
SAT — Supply Air Temperature Sensor
SPT — Space Temperature Sensor

NOTE: Reversing valve is on in Cooling mode.

PREMIERLINK CONTROLLER APPLICATIONS WITH DELUXE D CONTROL



LEGEND

LWT — Leaving Water Temperature Sensor
SAT — Supply Air Temperature Sensor
SPT — Space Temperature Sensor

NOTE: Reversing valve is on in Cooling mode.

Application data

Aquazone™ water source heat pump products are available in a flexible, efficient array of models, which can be used in all types of water loop, ground water, and ground loop type systems. Utilize Aquazone products to provide optimal energy efficient solutions and adapt to the most challenging design requirements.

AQUAZONE PRODUCT GUIDE

50 SERIES	TYPE SIZE (tons)	APPLICATION
50RHC,RVC Horizontal/Vertical	Standard Efficiency $^1/_2$-5 (RHC) $^3/_4$-5 (RVC)	Efficient, low cost alternative for retrofit or new boiler/tower systems.
50RHR,RVR Horizontal/Vertical	High Efficiency $^1/_2$-5	Efficient, adaptable unit for new boiler/tower, ground water, or ground loop systems.
50RDS,RHS,RVS Downflow/ Horizontal/Vertical	Premium Efficiency $1^1/_3$-6	Premium, ultra efficient unit for new boiler/tower, ground water, or ground loop systems
50PT	Premium Efficiency 2-5$^1/_2$	Premium, ultra efficient Puron® refrigerant 2-stage unit for new boiler/tower, ground water, or ground loop systems
50PS	Premium Efficiency $^1/_2$-6	Premium, ultra efficient Puron refrigerant unit for new boiler/tower, ground water, or ground loop systems
50HQL,VQL Horizontal/Vertical	Large Capacity 6-10 (HQL) 6$^1/_2$-25 (VQL)	Designed to handle large zoned areas for all applications.
50KQL	Console $^1/_2$-1$^1/_2$	Attractive design for finished interior, under-window installations.
50RTG	Rooftop 3-20	Economical solution for IAQ problems and tempering ventilation air.
50RWS	Water-to-Water 3-10	Used to pre-heat or cool air and can be used as a stand-alone or supplemental boiler/chiller in most hydronic heating applications. Also conditions process fluids, lubricants, and refrigerants.
50PSW	Water-to-Water 28	Efficient Puron refrigerant alternative to pre-heat or cool air and can be used as a stand-alone or supplemental boiler/chiller in most hydronic heating applications. Also conditions process fluids, lubricants, and refrigerants.

Water loop system

Water loop (or boiler/tower) system applications typically include a number of units plumbed to a common piping system. For optimal performance, this system should be designed between 2.25 and 3 gpm per ton of cooling capacity. The system is comprised of highly efficient packaged reverse cycle heat pump units interconnected by a water loop. The water circuit serves as both a sink and source for heat absorption and rejection and is designed for entering water temperatures between 60 F and 90 F. Within this temperature range units can heat or cool as required from the same water source. Transferring heat from warm to cold spaces in the building, whenever they coexist, conserves energy rather than creating new heat.

Refer to the **Carrier Water Source Heat Pump System Design Guide** for assistance with the design of water loop systems. The guide includes a practical approach for the latest and most current design recommendations including:

- Product application including horizontal, vertical, console, rooftop and water-to-water applications.
- Ventilation methods and system design including energy recovery.
- Acoustical considerations for different product types.
- Addressing indoor air quality (IAQ) issues such as condensate removal, humidity control.
- Air distribution design including diffuser selection/layout and ductwork design.
- Hydronic system design including pipe sizing/layout and boiler/tower sizing.
- Control configurations such as stand alone, DDC, DCV, and VVT® control systems.
- WSHP Efficiency/Operational Cost Comparison chart.
- System variations such as a system without a boiler, variable pumping, and VAV for interior use.

Ground water systems

To utilize Aquazone units in ground water applications, extended range should be specified. This will provide factory-installed insulation on the coaxial coil to prevent condensate from dripping when entering water temperatures are below 60 F. In addition, the copper coaxial coil installed on the Aquazone units may not be suitable for all water conditions. Refer to the Water Conditioning section for proper coaxial coil material selection.

Surface water system — This system is typically located near a lake or pond. In this application, the loop can be submerged in a series of coils beneath the water surface. The number of coils required depends on system load and design. This application requires minimum piping and excavation.

Open loop system — This system is used where ground water is plentiful. In this application, ground water is pumped through supply piping from the well to the building. The water is then pumped back into the ground through a discharge well as it leaves the building. An additional heat exchanger is usually installed between the building water piping system and the ground water piping system. This design limits the amount of piping and excavation required.

Aquazone units are provided with a standard TXV and are rated to extremely low temperatures to self-adjust the refrigeration circuit, therefore water regulating valves are not required on open loop systems. To conserve water on this type of system, a slow opening/closing solenoid valve is recommended.

Ground loop systems

There are many commonly specified designs for ground loop applications. Typical designs include vertical loops and horizontal loops. In some applications, water is piped from the ground or lake directly to the water source heat pump. Piping is limited to the amount of pipe required to get the water from the source to the unit.

NOTE: When utilizing Aquazone water source heat pumps in ground loop systems, refer to design considerations in the ground water system section.

Horizontal ground loop — This system is used when adequate space is available and trenching can be easily accomplished. A series of parallel pipes are laid out in trenches 3 to 6 ft below the ground surface, and then back-filled. Often, multiple pipes are used to maximize the heat transfer capability of each trench. The amount of pipe and the size of the ground loop field are based on ground conditions, heating, and cooling requirements of the application and system design.

Application data (cont)

Vertical ground loop — This system is used in vertical borehole applications. This design is well suited for retrofit applications when space is limited or where landscaping is already complete and minimum disruption of the site is desired. The vertical ground loop system contains a single loop of pipe inserted into a hole. The hole is back-filled and grouted after the pipe is inserted. The completed loop is concealed below ground. The number of loops required depends on ground conditions, heating and cooling requirements, and the depth of each hole.

Hybrid systems — In some applications, it may be beneficial to incorporate a cooling tower into the ground loop system to reduce the overall cost. A hybrid system discards excess heat into the air and increases the cooling performance of the ground loop.

Condensate drainage

Venting — Condensate lines should be properly vented to prevent fan pressure from causing water to hang up in the piping. Condensate lines should be pitched to assure full drainage of condensate under all load conditions. Chemical treatment should be provided to remove algae in the condensate pans and drains in geographical areas that are conducive to algae growth.

Trapping — Condensate trapping is an essential necessity on every water source heat pump unit. A trap is provided to prevent the backflow of moisture from the condensate pan and into the fan intake or downstream into the mechanical system. The water seal or the length of the trap depends on the positive or negative pressure on the drain pan. As a rule of thumb, the water seal should be sized for 1 in. for every 1 in. of negative pressure on the unit. The water seal is the distance from the bottom of the unit condensate piping connection to the bottom of the condensate drain line run-out piping. Therefore, the trap size should be double the water seal dimension.

Horizontal units — Horizontal units should be sloped toward the drain at a $^1/_4$ in. per foot pitch. If it is not possible to meet the pitch requirement, a condensate pump should be designed and installed at the unit to pump condensate to a building drain. Horizontal units are not internally trapped; therefore an external trap is necessary. Each unit must be installed with its own individual trap and means to flush or blowout the condensate drain. The design of a common trap or vent for multiple units is not acceptable. The condensate piping system should not be designed with a pipe size smaller than the drain connection pipe size.

Vertical units — Vertical units utilize a condensate hose inside the cabinet that acts as a trapping loop, therefore an external trap is not necessary. Each unit must be installed with its own vent and means to flush or blowout the condensate drain lines. Do not install a common trap or vent on vertical units.

Water conditioning

In some applications, maintaining proper water quality may require the use of higher corrosion protection for the water-to-refrigerant heat exchanger. Water quality varies from location to location and is unique for each job. Water characteristics such as pH value, alkalinity, hardness, and specific conductance are of importance when considering any WSHP application. Water typically includes impurities and hardness that must be removed. The required treatment will depend on the water quality as well as type of system. Water problems fall into three main categories:

1. Scale formation caused by hard water reduces the heat transfer rate and increases the water pressure drop through the heat exchanger. As water is heated, minerals and salts are precipitated from a solution and deposited on the inside surface of the pipe or tube.
2. Corrosion is caused by absorption of gases from the air coupled with water on exposed metal. Corrosion is also common in salt-water areas.
3. Organic growths such as algae can reduce the heat transfer rate by forming an insulating coating on the inside tube surface. Algae can also promote corrosion by pitting.

NOTE: In most commercial water loop applications, Aquazone™ WSHP units use copper water-to-refrigerant heat exchanger. Units can also be equipped with a cupronickel heat exchanger for applications where water is outside the standard contaminant limits for a copper heat exchanger.

WATER QUALITY GUIDELINES

CONDITION	ACCEPTABLE LEVEL		
pH	7 to 9 range for copper. Cupronickel may be used in the 5 to 9 range.		
Total Hardness	Calcium and magnesium carbonate should not exceed 20 grains per gallon (350 ppm).		
Iron Oxides	Less than 1 ppm.		
Iron Bacteria	No level allowable.		
Corrosion*		Max Allowable Level	Coaxial Metal
	Ammonia, Ammonium Hydroxide	0.5 ppm	Cu
	Ammonium Chloride, Ammonium Nitrate	0.5 ppm	Cu
	Ammonium Sulfate	0.5 ppm	Cu
	Chlorine/Chlorides	0.5 ppm	CuNi
	Hydrogen Sulfide†	None Allowable	—
Brackish	Use cupronickel heat exchanger when concentrations of calcium or sodium chloride are greater than 125 ppm are present. (Seawater is approximately 25,000 ppm.)		

*If the concentration of these corrosives exceeds the maximum allowable level, then the potential for serious corrosion problems exists.

†Sulfides in the water quickly oxidize when exposed to air, requiring that no agitation occur as the sample is taken. Unless tested immediately at the site, the sample will require stabilization with a few drops of one Molar zinc acetate solution, allowing accurate sulfide determination up to 24 hours after sampling. A low pH and high alkalinity cause system problems, even when both values are within ranges shown. The term pH refers to the acidity, basicity, or neutrality of the water supply. Below 7.0, the water is considered to be acidic. Above 7.0, water is considered to be basic. Neutral water contains a pH of 7.0.

NOTE: To convert ppm to grains per gallon, divide by 17. Hardness in mg/l is equivalent to ppm.

Acoustical design

Sound power levels represent the sound as it is produced by the source, the WSHP unit, with no regard to attenuation between the source and the space. Acoustical design goals are necessary to provide criteria for occupied spaces where people can be comfortable and communicate effectively over the background noise of the air-conditioning system and other background noise sources.

Acoustical design goals are desirable sound pressure levels within a given conditioned space and are represented

by noise criteria (NC) curves. Noise criteria curve levels represent a peak over a full spectrum of frequencies. A high value in a low frequency band has the same effect on NC level as a lower value in a high frequency band. It is important that sound levels be balanced over the entire spectrum relative to the NC curve. The lower the NC criteria curve, the more stringent the room acoustical design must be to meet the design goals.

It is important to know how to convert NC levels from the unit ratings in terms of sound power (Lw). This conversion depends on the specifics of the acoustical environment of the installation.

The resulting calculations are compared to the NC curve selected for the area to assess the acoustical design.

Some of the factors that affect conversion of sound power to sound pressure and consequent NC level include:

- Type of acoustical ceiling
- Use of metal or flex duct
- Absorption in the occupied space
- Location in the occupied space
- Open or closed layout plan
- Use of open or ducted returns
- Orientation of unit to occupant
- Use of lined or unlined duct

OCTAVE BAND SOUND PRESSURE LEVEL (Lp) ASSOCIATED WITH NC CURVES

NOISE CRITERIA CURVES	OCTAVE BAND SOUND PRESSURE LEVEL (Lp) Frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
NC-15	49	36	26	17	17	14	12	11
NC-20	52	41	33	27	22	19	17	16
NC-25	54	45	38	31	27	24	22	21
NC-30	58	49	41	36	31	29	28	27
NC-35	61	53	45	40	36	34	33	32
NC-40	64	57	50	45	41	39	38	37
NC-45	67	61	54	49	46	44	43	42
NC-50	71	64	58	54	51	49	48	47
NC-55	74	68	63	58	56	54	53	52
NC-60	77	71	67	63	61	59	58	57
NC-65	80	75	71	68	66	64	63	62

WSHP sound control

The analysis of the projected sound level in the conditioned space caused by a WSHP unit located in a ceiling plenum is quite involved. The key is to have good sound power ratings (Lw) in dB on the equipment to determine the sound attenuation effect of the ductwork, ceiling and room. In combination with utilizing standard Aquazone™ equipment attenuating features or the advanced mute package features, suggestions for horizontal and vertical unit sound design are provided to design around the WSHP units.

Horizontal units

Use the following guidelines for layout of Aquazone horizontal units to minimize noise:

1. Obtain sound power ratings in accordance with latest standards from manufacturers to select quietest equipment.
2. Do not locate units over a space with a required NC of 40 or less. Instead, locate units above less sensitive noise areas such as above or in equipment rooms, utility closets, restrooms, storage rooms, or above corridors.
3. Provide at least 10 ft between WSHP units to avoid the additive effect of two noise sources.
4. Provide an acoustical pad underneath the WSHP unit in applications where the unit must be mounted above noise sensitive areas such as private offices or conference rooms. The pad attenuates radiated noise. Be sure the pad has an area at least twice that of the WSHP footprint.
5. Maximize the installed height above the suspended ceiling.
6. Be sure the WSHP unit is located at least 6 ft away from any ceiling return grille to prevent line-of-sight casing noise to reach the space below.
7. Suspend the WSHP unit from the ceiling with hangers that utilize spring or neoprene type isolators to reduce vibration transmission.
8. Utilize flexible electrical connections to the WSHP unit. DO NOT USE NOT RIGID CONNECTIONS.
9. Utilize flexible loop water and condensate piping connections to the WSHP unit.
10. Use a canvas duct connector to connect the WSHP discharge to the downstream duct system. This reduces vibration-induced noise.
11. Provide acoustic interior lining for the first 20 ft of discharge duct, or until the first elbow is reached. The elbow prevents line-of-site sound transmission in the discharge duct.
12. Provide turning vanes in ductwork elbows and tees to reduce air turbulence.
13. Size the sheet metal supply duct with velocities no greater than 1000 fpm.
14. Ensure ductwork is rigid.
15. Use round duct whenever possible to further reduce noise.
16. Allow at least 3 equivalent duct diameters of straight duct upstream and downstream of the unit before allowing any fittings, transitions, etc.
17. Seal all penetrations around duct entering the space.
18. Provide a 4-ft runout duct made of flexible material to connect a diffuser to the supply trunk duct. The flex duct provides an “attenuating end-effect” and reduces duct-transmitted sound before it reaches the space. Typically a 6 dB sound reduction can be accomplished with the use of flex duct.
19. Locate the runout duct balancing damper as far away from the outlet diffuser as possible. Locating the balancing damper at the trunk duct exit is the best location.
20. If return air is drawn through a ceiling plenum, provide an acoustically lined return duct elbow or “L” shaped boot at the WSHP to eliminate line-of-sight noise into the ceiling cavity and possible through ceiling return

air grilles. Face the elbow or boot away from the nearest adjacent WSHP unit to prevent additive noise.

21. Do not hang suspended ceiling from the ductwork.

Vertical units

All guidelines established for horizontal units also apply for vertical units. In addition, since vertical units tend to be installed in small equipment rooms or closets, the following additional guidelines apply:

1. Mount the unit on a pad made of high-density sound absorbing material such as rubber or cork. Extend the pad beyond the WSHP unit footprint by at least 6 inches in each direction.
2. Since the unit returns airflow through a grille mounted in a closet door, provide a sound barrier or some other modification of the closet to prevent line-of-site noise into the space.
3. Follow good duct design practice in sizing and locating the connection of the WSHP discharge to the supply duct system. Use an elbow with turning vanes and bent in the direction of the fan rotation to minimize turbulence. Make any duct transitions as smooth and as gradual as possible to again minimize turbulence and loss of fan static pressure.

Solenoid valves

In applications using variable flow pumping, solenoid valves can be field installed and operated from the control board in the Aquazone™ WSHP unit.

Freeze protection

Applications where systems are exposed to outdoor temperatures below freezing (32 F) must be protected from freezing. The most common method of protecting water systems from freezing is adding glycol concentrations into the water. Design care should be used when selecting both the type and concentrations of glycol utilized due to the following:

- Equipment and performance may suffer with high concentrations of glycol and other antifreeze solutions.
- Loss of piping pressure may increase greatly, resulting in higher pumping costs.
- Higher viscosity of the mixture may cause excess corrosion and wear on the entire system.
- Acidity of the water may be greatly increased, promoting corrosion.
- Glycol promotes galvanic corrosion in systems of dissimilar metals. The result is corrosion of one metal by the other, causing leaks.

TYPICAL UNIT OPERATING PRESSURES AND TEMPERATURES

ENTERING WATER TEMP (F) (EWT)	GPM/ TON	COOLING						HEATING					
		Suction Pressure (PSIG)	Discharge Pressure (PSIG)	Super-heat (F)	Sub-cooling (F)	Water Temp Rise (F)	Air Temp Drop (F) DB	Suction Pressure (PSIG)	Discharge Pressure (PSIG)	Super-heat (F)	Sub-cooling (F)	Water Temp Drop (F) DB	Air Temp Rise (F)
30	1.5	75-85	90-105	25-40	12-20	21-24	21-26	34- 39	167-186	12-16	1-4	7.6- 8.4	14-20
	2.3	74-84	80- 95	25-40	11-18	13-16	21-26	37- 43	172-191	12-16	1-4	4.8- 5.6	16-22
	3.0	73-83	70- 85	25-40	10-16	6-11	21-26	40- 46	177-196	12-16	1-4	3.4- 4.2	16-22
50	1.5	75-85	125-155	12-20	10-18	20-23	20-25	50- 60	180-210	10-17	1-5	10.8-11.9	23-29
	2.3	74-84	120-142	12-20	9-16	12-15	20-25	53- 62	185-215	10-17	1-5	6.7- 8.1	24-30
	3.0	73-83	115-138	12-20	8-14	8-12	20-25	55- 65	190-220	10-17	1-5	5.1- 5.9	25-31
70	1.5	75-85	179-198	9-16	8-15	19-22	19-24	71- 82	205-230	14-19	1-5	14.0-15.2	28-34
	2.3	74-84	168-186	9-16	8-14	12-17	19-24	73- 85	210-238	14-19	1-5	9.0-10.2	30-37
	3.0	73-83	158-175	9-16	8-12	7-12	19-24	76- 88	215-242	14-19	1-5	6.7- 7.9	31-38
90	1.5	75-85	229-251	9-17	8-15	18-21	17-23	85- 95	220-260	18-28	2-5	14.4-16.6	32-39
	2.3	74-84	218-241	9-17	8-14	10-14	17-23	90-100	225-265	18-28	2-5	10.8-12.4	33-41
	3.0	73-83	208-230	9-17	8-12	6-11	17-23	95-105	230-270	18-28	2-5	7.2- 8.3	35-42
110	1.5	77-87	280-320	8-15	10-25	17-20	15-20						
	2.3	76-86	270-310	8-15	10-24	9-13	15-20						
	3.0	75-85	260-300	8-15	10-22	5-10	15-20						

LEGEND

DB — Dry Bulb
EAT — Entering Air Temperature

NOTES:
1. Based on nominal 400 cfm per ton airflow, 70 F EAT heating and 80/67 F EAT cooling.
2. Cooling air and water numbers can vary greatly with changes in humidity.
3. Subcooling is based upon the head pressure at compressor service port.

WATER TEMPERATURE CHANGE THROUGH HEAT EXCHANGER

WATER FLOW RATE (GPM)	COOLING RISE (F)		HEATING DROP (F)	
	Min	Max	Min	Max
For Closed Loop: Ground Source or Cooling/Boiler Systems at 3 gpm/ton	9	12	4	8
For Open Loop: Ground Water Systems at 1.5 gpm/ton	20	26	10	17

Guide specifications

Packaged High Efficiency Water Source Heat Pumps

HVAC Guide Specifications

Size Range: **5,400 to 59,000 Btuh Cooling Capacity**
7,400 to 68,000 Btuh Heating Capacity

Carrier Unit: **50RHR, 50RVR**

Part 1 — General

1.01 SYSTEM DESCRIPTION

A. Install water source heat pumps, as indicated on the plans with capacities and characteristics as listed in the schedule and the specifications that follow. Units shall be horizontal or vertical configurations.

B. Units shall be supplied completely factory built and capable of operation with an entering water temperature range from 60 to 95 F as standard (20 to 110 F extended range).

Equivalent units from other manufacturers can be proposed provided approval to bid is given 10 days prior to bid closing.

C. Units shall be individually packaged with wooden skid covered with protective corner posts and plastic stretch wrapping for maximum protection.

1.02 QUALITY ASSURANCE

A. All equipment listed in this section must be rated in accordance with ARI/ASHRAE/ISO 13256-1 performance standard and CSA. The units shall have ARI/ISO, NRTL, and CSA labels.

B. All units shall be factory tested under normal operating conditions at nominal water flow rates. This testing shall generate a report card to be shipped with each unit stating performance in both Heating and Cooling modes.

C. Serial numbers will be recorded by factory and furnished to contractor for ease of unit warranty status. Units which are tested without water flow rates are not acceptable.

Part 2 — Product

2.01 EQUIPMENT

A. General:

1. The horizontal and vertical heat pumps shall be fabricated from heavy gage galvanized sheet metal. All interior surfaces shall be lined with $1/2$ in. thick, $1\,1/2$ lb acoustic type fiberglass insulation. All fiberglass shall be coated and have exposed edges tucked under flanges to prevent the introduction of glass fibers into the airstream. All insulation must meet NFPA 90A.
2. Units shall be prewired and precharged in factory.

B. Unit Cabinet:

1. Units must have the ability to be field convertible from side to back or back to side discharge with no additional parts or unit structure modification. Units will have factory-installed hanger brackets and isolation grommets.
2. Horizontal units shall have one of the following airflow arrangements: right-discharge/left-return; left-discharge/right-return; back-discharge/left-return; or back-discharge/right-return as shown on the plans.
3. Vertical units shall have one of the following airflow arrangements: left-return/top-discharge, or right-return/top-discharge. All vertical units will be supplied from the factory internally trapped.
4. If units with these arrangements are not used, the contractor is responsible for any extra costs incurred by other trades.
5. Cabinets shall have separate openings and knockouts for entrance of line voltage and low voltage control wiring. Contractor must ensure that units can be easily removed for servicing and coordinate locations of electrical conduit and lights with the electrical contractor.
6. All units must have a minimum of three access panels for serviceability of compressor compartment. If other arrangements make servicing difficult, the contractor must provide access panels and clear routes to ease service. Architect must approve any changes in layout.
7. All units must have an insulated panel separating the fan compartment from the compressor compartment.
8. Optional mute package shall consist of high technology sound attenuating materials that are strategically applied to the cabinet, in addition to the standard system, to further dampen sound.
9. Units with the compressor in the airstream are not acceptable.

C. Fan and Motor Assembly:

1. Units rated 60,000 Btuh and under shall have a direct-drive centrifugal fan. The fan motor shall be 3-speed, permanently lubricated, PSC (permanent split capacitor) type with internal thermal overload protection.
2. Blower shall have inlet rings to allow removal of wheel and motor from one side without removing housing.
3. Units supplied without permanently lubricated motors must provide external oilers for easy service.

4. The fan motor shall be isolated from the fan housing by torsionally flexible isolation grommets. The fan and motor assembly must be capable of overcoming the external static pressures as shown on the schedule.
5. The cfm/static pressure rating of the unit shall be based on a wet coil and a clean filter in place.

D. Refrigerant Components:

1. Units shall have a sealed refrigerant circuit including a high efficient scroll, rotary or reciprocating compressor designed for heat pump operation.
2. Units shall have a thermostatic expansion valve for refrigerant metering, an enhanced aluminum lanced fin and rifled copper tube refrigerant to air heat exchanger, a reversing valve, a coaxial (tube-in-tube) refrigerant-to-water heat exchanger.
3. Hermetic reciprocating compressors shall be internally sprung. The compressor will be mounted on external computer selected isolating springs. The external springs will be secured to rails that are isolated from the cabinet base. Compressor shall have thermal overload protection and be located in an insulated compartment away from airstream to minimize sound transmission.
4. Refrigerant-to-air heat exchangers shall utilize enhanced lanced aluminum fins and rifled copper tube construction rated to withstand 450 psig refrigerant working pressure.
5. Refrigerant-to-water heat exchangers shall be of copper inner-water tube and steel refrigerant outer tube design, rated to withstand 450 psig working refrigerant pressure and 450 psig working water pressure. Plate-to-plate heat exchangers cannot be used.
6. Refrigerant metering shall be accomplished by thermostatic expansion valve only. Units intended for use in standard operating range with entering water temperatures from 60 to 95 F.
7. Reversing valves shall be four-way solenoid activated refrigerant valves which shall fail to heating operation should the solenoid fail to function. If the reversing valve solenoid fails to cooling, a low temperature thermostat must be provided to prevent over-cooling an already cold room.
8. Optional cupronickel coaxial water-to-refrigerant heat exchangers.
9. Optional extended range for units operating with entering water temperatures below dew point. For use in operating range with entering water temperatures from 20 to 110 F.
10. Optional two-way water control valve.
11. Water circuit options to provide internally mounted 2.5 or 3.0 gpm per ton automatic flow regulating valves.

E. Drain Pan:

The drain pan shall be constructed to inhibit corrosion and is fully insulated. Drain outlet shall be located on pan as to allow complete and unobstructed drainage of condensate. Vertical units will be supplied with factory-installed trap inside of cabinet. The unit as standard will be supplied with solid-state electronic condensate overflow protection. Mechanical float switches are not acceptable.

F. Filter:

1. Units shall have a factory installed 1 in. wide filter bracket for filter removal from either side. Units shall have a 1 in. thick throwaway type fiberglass filter.
2. The contractor shall purchase one spare set of filters and replace factory shipped filters on completion of start-up.
3. Filters shall be standard sizes. If units utilize non-standard filter sizes then the contractor shall provide 12 spare filters for each unit.
4. Field installed 2 in. filter brackets and 2 in. fiberglass throwaway filters on all units can be installed by contractor.

G. High Static Blower:

Blower provides increased airflow at various static pressure conditions. Available in size 048 for 50RHR,RVR units.

H. Controls and Safeties:

1. Electrical:
   a. A control box shall be located within the unit compressor compartment and shall contain a 50 va transformer, 24-volt activated, 2 or 3 pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. Electromechanical operation is not acceptable.
   b. Units shall be nameplated for use with time-delay fuses or HACR circuit breakers. Unit controls shall be 24-volt and provide heating or cooling as required by the remote thermostat/sensor.
2. Piping:
   a. Supply and return water connections shall be copper FPT fittings and shall be securely mounted flush to the cabinet corner post allowing for connection to a flexible hose without the use of a back-up wrench.

b. All water connections and electrical knockouts must be in the compressor compartment corner post as to not interfere with the serviceability of unit. Contractor shall be responsible for any extra costs involved in the installation of units that do not have this feature.

3. Unit Controls:
   a. Safety controls including a high-pressure switch, a low-pressure sensor, and a low water and low air temperature sensor. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service.
   b. Activation of any safety device shall prevent compressor operation via a lockout device. The lockout shall be reset at the thermostat or at the contractor-supplied disconnect switch.
   c. Units which may be reset only at the disconnect switch only shall not be acceptable.
4. The standard Complete C control electronic control system shall interface with a heat pump (Y,O) wall thermostat (mechanical or electronic). The control system microprocessor board shall be specifically designed to protect against building electrical system noise contamination, EMI, and RFI interference. The control system shall have the following features:
   a. 50-va transformer.
   b. Performance monitor (PM). The PM warns when the heat pump is running inefficiently.
   c. Anti-short cycle time delay on compressor operation time delay shall be 5 minutes minimum.
   d. Random start on power up mode.
   e. Low voltage protection.
   f. High voltage protection.
   g. Unit shutdown on high or low refrigerant pressures.
   h. Unit shutdown on low water temperature.
   i. Water coil freeze protection (selectable for water or antifreeze).
   j. Air coil freeze protection (check filter switch).
   k. Condensate overflow shutdown.
   l. Option to reset unit at thermostat or disconnect. Fault type shall be retained in memory if reset at thermostat.
   m. Automatic intelligent reset. Unit shall automatically reset 5 minutes after trip if the fault has cleared. Should a fault reoccur 3 times sequentially then permanent lockout will occur.
   n. Ability to defeat time delays for servicing.
   o. Light-emitting diodes (LEDs) to indicate high pressure, low pressure, low voltage, high voltage, air/water freeze protection, condensate overflow and control status.
   p. The low-pressure switch SHALL NOT be monitored for the first 90 seconds after a compressor start command to prevent nuisance safety trips.
   q. Remote fault type indication at thermostat.
   r. Selectable 24-v or pilot duty dry contact alarm output.
   s. 24-v output to cycle a motorized water valve with compressor contactor.
   t. Electric heat output to control two stages of electric heat.
   u. Service test mode for troubleshooting and service.
5. Optional electronic Deluxe D control shall have all the features of the Complete C control with the following additional features:
   a. 75-va transformer.
   b. A removable thermostat connector.
   c. Random start on return from night setback.
   d. Intelligent reversing valve operation for extended life and quiet operation.
   e. Night setback control from low temperature thermostat, with 2-hour override initiated by a momentary signal from the thermostat.
   f. Dry contact night setback output for digital night setback thermostats.
   g. Ability to work with heat/cool (Y, W) thermostats.
   h. Ability to work with heat pump thermostats using O or B reversing valve control.
   i. Single grounded wire to initiate night setback, or emergency shutdown.
   j. Boilerless system control can switch automatically to electric heat at low loop water temperature.
   k. Dehumidistat input providing fan control for dehumidification operating.
   l. Multiple units connected to one sensor providing communication for up to 3 water source heat pumps.
   m. Selection of boilerless changeover temperature set point.
   n. Compressor relay staging for dual stage units or in master/slave applications.

6. PremierLink™ Controller:

   This optional control will function with CCN and ComfortVIEW™ software. It shall also be compatible with *Comfort*Link™ controllers. It shall be ASHRAE 62-99 compliant and Internet ready. It shall accept a CO_2 sensor in the conditioned space and be demand controlled ventilation (DCV) ready. The communication rate must be 38.4K or faster. It shall include an integrated economizer controller.

I. Special Features:

1. Thermostat Controls:
   a. Programmable multi-stage thermostat offers 7-day clock, holiday scheduling, large backlit display and remote sensor capability.
   b. Programmable 7-day light activated thermostat offers occupied comfort settings with lights on, unoccupied energy savings with lights off.
   c. Programmable 7-day flush mount thermostat offers locking coverplate with tamper proof screws, flush to wall mount, dual point with adjustable deadband, O or B terminal, and optional remote sensor.
   d. Programmable 5-day thermostat offers 2-stage heat, 2-stage cool, auto changeover, 5-minute built-in compressor protection, and included locking cover.
   e. Non-programmable thermostat offers 2 heat stages, 2 cool stages, auto changeover, 5-minute built-in compressor protection, and included locking cover.
2. Loop controller is available with six stages (2 stages for heating and 4 stages for heat rejection).
3. Filter rack (2 in.) enhances the filtration system of the water source heat pump.

   NOTE: Filter rack does not include filters.
4. Fire-rated hoses kit with a fixed MPT on one end and a swivel with an adapter on the other end. Hose kits can be either stainless steel or galvanized.
5. Ball valves (brass body) can be provided for shut off and balancing water flow. Valves are available with memory, memory stop, and pressure temperature ports.
6. Y strainers (bronze body) are "Y" type configuration with a brass cap and stainless steel strainer screen. Maximum operating pressure rating of strainers is 450 psi.
7. Solenoid valves (brass body) provide slow operation for quiet system application.
8. Hose kit assemblies include a ported ball valve with pressure temperature (P/T) plug ports and flexible stainless steel hose with swivel and nipple. Return hose includes a ball valve, preset measure flow (gpm) with two P/T ports, and flexible stainless steel hose with a swivel and nipple.
9. Remote sensors are available for Aquazone™ flush-mount thermostats.
10. PremierLink accessories can be provided for a fully-integrated DDC system. Accessories include supply air temperature sensors, communicating room sensors, CO_2 sensors, and linkage thermostats.
11. An Aquazone system control panel is available as specified in the 50RLP Product Data (525-00040).